Analysis of Antenna Types Performance in Mobile Phone Base Station

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Abstract: The paper is evaluate the usage antenna type k742225 in Kalar towers mobile phone base station in Asia cell in Kurdistan in south of Sulymaniya. By studying the characteristics of the above type of antenna in this paper a comparison made between the performance of antenna type k742225 and Kathrein antenna other types for Kalar towers mobile phone base station in Asia cell by using the Tool Site master. Simulation results indicate that antenna type k742225depends on the network environment and different environments may lead to different optimization results in terms of capacity and coverage performance. The result shows that coverage analysis best compare to Kathrein antenna other types, Kathrein antennas type k742225 still have better performance in term of coverage enhancement and interference control. This pattern we can see the first NULL of Kathrein antenna type k742225 show better attenuation than Kathrein antenna other types and also it have bigger vertical beam width and under the antenna Kathrein have more propagation. To finding the suitable Kathrein antenna type is a very critical issue in cellular network, since it affects the system performance, aiming to enhance the signal strengths of serving cells, in addition to reducing the interference levels with the cellular system.

Keywords**: k742225 Antenna, Tower, Mobile Phone, Capacity, Coverage**

1. Introduction

Wireless communication has been experiencing development during the past decade. There has recently been explosive growth in the use of mobile communications. Today's operators of mobile-communication systems face a problem, more acute than before, of ensuring good quality of service, which generally means providing not only good coverage but also low interference. When estimating the coverage or radiation pattern of mobile base station, engineer must rely on the manufacturer-provided antenna radiation pattern (Saba, 2015). In most cases, carefully optimizing the down tilt angels produces enhanced signal strength levels at the targeted areas, thus reducing the interference levels from other covering cells. However, excessive down tilt.

Angle may lead to dramatic coverage shortages, specifically at the edges of the main loop direction (Huawei Technologies, 2009; Kathrin Antennen Electronic, 2011). Kathrein Panel antennas are designed, manufactured, and tested using modern computer modeling methods, up-to-date manufacturing techniques and sophisticated measurement equipment to assure that every antenna that bears the Kathrin name will provide long, reliable performance, strength, longevity and reliability. Our antennas are designed to withstand the shock, vibration, moisture resistance, salt spray, icing and temperature extremes according to rigorous IEC world standards for antennas

(Kathrin Inc. 2013). Fig.1. shows places asking for the Kathrin Panel antennas in the world.

Figure 1: Kathrin Panel Antennas in the World

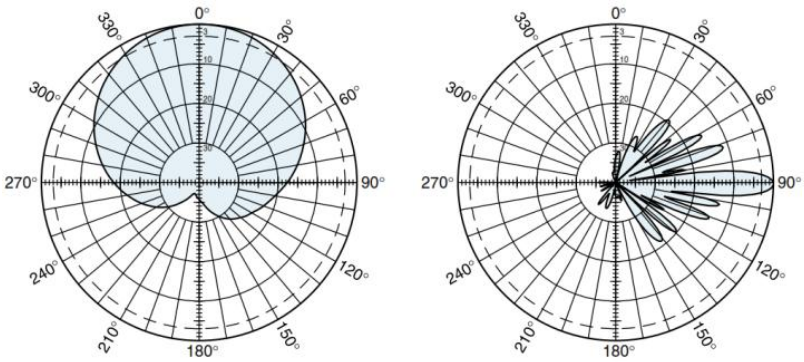
Designs utilize a production process known as pulltrusion. This method of fabrication forces when cured has a tensile strength some 4 times greater than injection-molded, thermoformed. Radom may expand by as much as .117 inches under elevated temperature conditions, while a Kathrein radom of the same size expands only .016 inches. Of course, better joint stability means better sealing, which prevents moisture entry. There are commercially available antenna's that can remotely change their down-tilt, azimuth and beam width (Kathrin Antennen Electronic, 2010, 2011).

Kathrein's dual band antennas are ready for 3G applications, covering all existing wireless bands as well as all spectrum under consideration for future systems, AMPS, PCS and 3G/UMTS. These cross-polarized antennas offer diversity operation in the same space as a conventional 800 MHz antenna, and are mountable on our compact sector brackets (Kathrin Inc. 2013).

2. Methodology

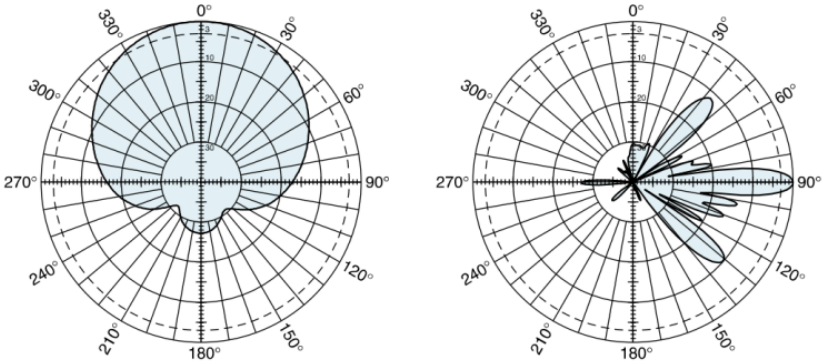
The angle of the main beam of the antenna below the horizontal plane is called antenna tilt. Positive and negative angles are also referred to as downtilt and up-tilt respectively (Huawei Technologies, 2009). In electrical down tilt, main, side and back lobes are tilted uniformly by adjusting phases of antenna elements. However, in mechanical down tilt, antenna main lobe is lowered on one side and the antenna back lobe is raised on the other side because antenna elements are physically directed towards ground in mechanical down tilt (Huawei Technologies, 2009).

The frequency range for K742225 are 824–960/1710–2180MHz, while for K739686 are 806–960MHz and for K739684 are 824–960MHz. The three types have the same polarization, impedance, isolation and VSWR are +45°, –45°, 50 Ω, > 30 dB, and < 1.5 respectively. But for gain in K742225 is 17/18.5dBi, for K739686 17.5 dBi and for K739684 is 15 dB (Kathrin Inc. 2013; Louis, 2010). Electrical tilt continuously adjustable for K742225 is 0°–7°/0°–6°T as same K739686, while for K739684 is 0°–14°T. Fig. 2, 3, 4 show the horizontal and vertical pattern for K742225, K739686 and K739684 respectively.



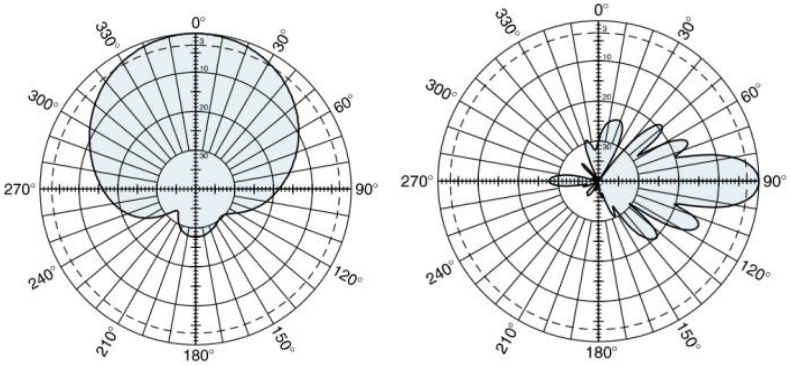
(a) Horizontal Pattern (b) Vertical Pattern

Figure 2. Horizontal and Vertical Pattern for K742225



(a) Horizontal Pattern (b) Vertical Pattern

Figure 3. Horizontal and Vertical Pattern for K739686

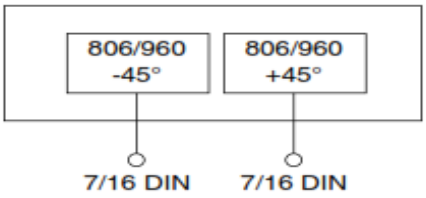


(a) Horizontal Pattern (b) Vertical Pattern

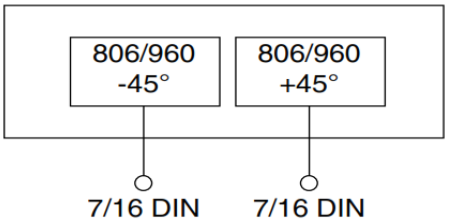
Figure 4. Horizontal and Vertical Pattern for K739684.

As shown from kathrein antenna type K742225 Fig. 2 (a) the horizontal pattern are have a wide main lobe with no back lobe, while for kathrein antenna typesK739686 and K739684 in fig.3 (a) and fig.4 respectively horizontal pattern are have a wide main lobe with little back lobe. while for vertical pattern the three last types have same main, side and back lobes as shown in

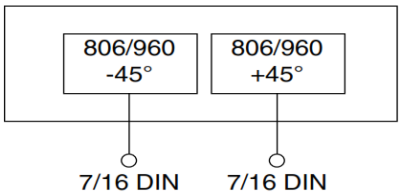
fig.2(b),fig3.(b) and fig.4(b) respectively. The Maximum power are 250 W for Kathrein antenna type K742225, while for K739686 are 500 W and for K739684 are 400 W (at 50 °C ambient temperature). The Fig.5 (a), (b) and (c) show the mechanical specification for Kathrin antenna types K742225, K739686 and K739684 respectively in details (Kathrin Antennen Electronic, 2014).



(a) Mechanical Specification for Kathrein Antenna TypeK742225.



(b) Mechanical Specification for Kathrein Antenna TypeK739684.



(c)Mechanical Specification for Kathrein Antenna TypeK739684.

Figure 5. Mechanical Specification for Kathrin Antenna Types K742225, K739686 and K739684.

As shown from Fig. 4 the same input for each type, so as for Connector position, while for Adjustment mechanism are 1x, Position bottom, continuously adjustable for each K739686 and K739684, while the twice for K742225 (Louis, 2010). But for Height of K742225 are 2516 mm while for K739686 are 2580 mm , and for K739684 are 1296 mm, but the three types have the same width are 262 mm, also the depth have the same for K739686 and K739684 are 116 mm but the depth for K742225 are bigger than the two last types (39 mm) (Kathrin Antennen Electronic, 2014).

3. Results

To finding the suitable Kathrein antenna type is a very critical issue in cellular network, since it effects on the system performance, aiming to enhance the signal strengths of serving cells, in addition to reducing the interference levels with the cellular system. Fig. 6 shows Kalar city by Google Earth Map in Kurdistan in south of Sulymaniya.

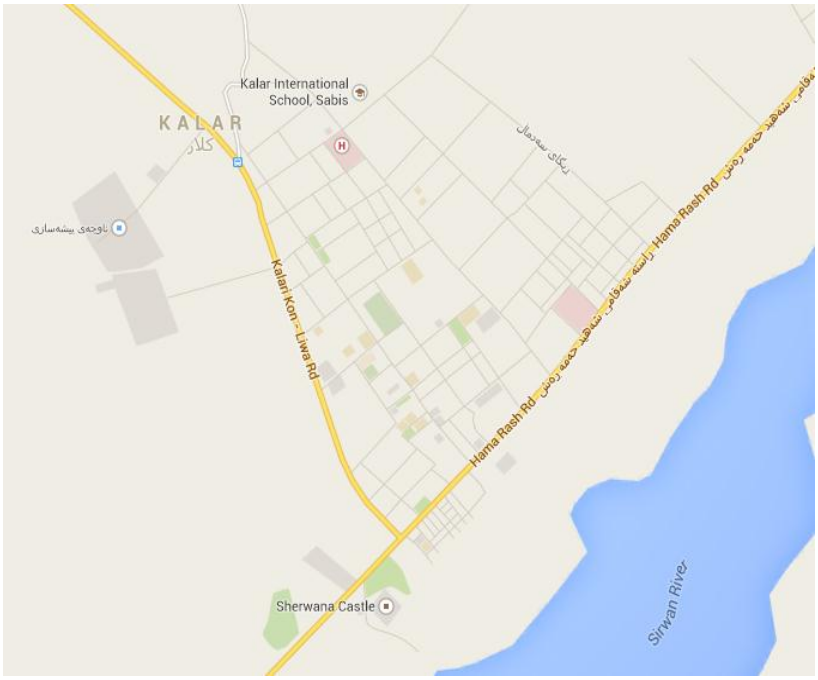


Figure 6. Kalar City by Google Earth Map

By studying the characteristics of the Kathrein antenna types by choosing Kalar city towers mobile phone base station in Asia cell in Kurdistan in Suoth of Sulymaniya. As shown in fig.7.

Figure 7. Kalar City Towers.

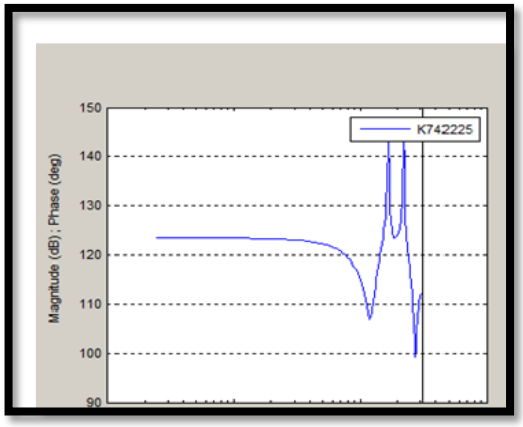
There are 33 site in kalar city almost of these sites used type K742225 there are: Kalar_0616, Kalar2_0757, Kalar3_0681, Kalar4_0744, KalarFc_0748, Kalarikon_0743, KalarMk_0760, NwKalar_0645,Smood2_0729, Kalar3_0681, NwKalar_0645,Smood3_0724, Kalarikon_0743. And the other lest have the antenna type K739684, K739686, K730378 and K80010305.

Table 1:
The Antenna Type And The Number Of Sectors For Each Sites In Kalar City.

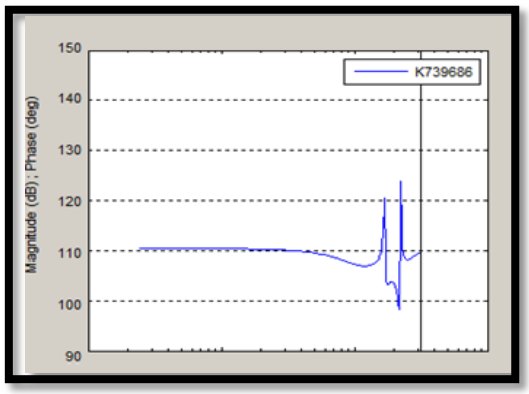
Site Name	Antenna type	No. of Sectors
GrdaGozina_0746	K739684	3
Kalar_0616	K742225	6
Kalar2_0757	K742225	6
Kalar3_0681	K742225	3
Kalar4_0744	K742225	6
KalarFc_0748	K742225	6
Kalarikon_0743	K742225	3
KalarMk_0760	K742225	6
NwKalar_0645	K742225	3
Pebaz_0693	K739684	3
Smood2_0729	K742225	6
Tazade_0756	K730378	3
BanAsiaw_0820	K730378	2
Kalar3_0681	K742225	3
NwKalar_0645	K742225	3
Bardasur_0799	K80010305	3
Bardasur2_0838	K739686	3
Smood3_0724	K742225	6
Kalar8_0839	K739686	3
Kalar9_0837	K739686	3
Kalar10_0840	K739686	3
Kalar11_0841	K739686	3
Kalar13_0836	K739686	3
Kelabarza_0824	K739686	2
Kalarikon_0743	K742225	3

As shown from Table1. The antenna types and the number of sectors for each sites in Kalar city, according to table 1. For kathrein antenna type K742225 there are six sectors used in Kalar_0616, Kalar2_0757,Kalar4_0744, KalarFc_0748,KalarMk_0760,Smood2_0729 and Smood3_0724 site respectively. While three sectors used inKalar3_0681.

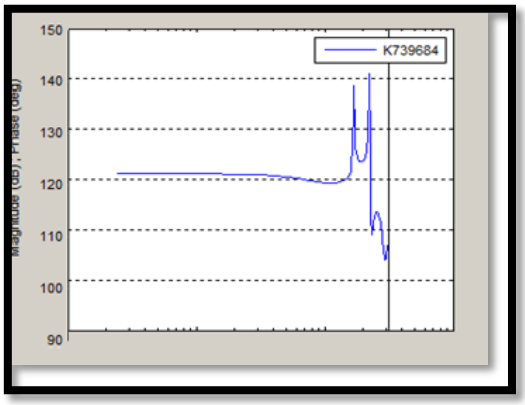
Kalarikon_0743, Nw Kalar_0645,Kalar3_0681, NwKalar_0645,Kalarikon_0743.



(a) Performance Kathrin Antenna Type K742225



(b) Performance Kathrin Antenna Type K739686



(c) Performance Kathrin Antenna type K739684.

Figure 8. Performance Kathrin Antenna types K742225, K739686 and K739684.

From Fig. 8 shows three curves for performance Kathrin Antenna Types K742225, K739686 AndK739684 respectively. By comparing on performance for the three last types. From fig 8 (a) the Antenna Type K742225 performance starting with higher than 130 dB more than the curves. In fig8 (b) for antenna type K739686 where the its lower than the magnitude of 110 dB so as for the last curve in fig8(c), the Kathrin Antenna Type K739684 better than from Kathrin Antenna Type K739686 where its magnitude starting at 120 dB, but not reached Kathrin Antenna Type K742225.

It's clear from the curve that Kathrin Antenna Type K742225 have good performing also it is better than other Kathrin Antenna Type K739686 And K739684. Simulation results indicate that optimum down tilt angle depends on the network environment and different environments may lead to different optimization results in terms of capacity and coverage performance.

4. Conclusion

This paper is evaluate the usage antenna type k742225 in Kalar towers mobile phone base station in Asia cell in Kurdistan in suoth of sulymaniya. By studying the characteristics of the above type of antenna. In this paper a comparison made between the performance of antenna type k742225 and Kathrein antenna other types for Kalar towers mobile phone base station in Asia cell. Simulation results indicate that antenna type k742225depends on the network environment and different environments may lead to different optimization results in terms of capacity and coverage performance. The result shows that coverage analysis best compare to Kathrein antenna other types. Kathrein antennas type k742225 still have better performance in term of coverage enhancement and interference control. This pattern we can see the first NULL of Kathrein antenna type k742225 show better attenuation than Kathrein antenna other types and also it has bigger vertical beam width and under the antenna Kathrein have more propagation. To finding the suitable Kathrein antenna type is a very critical issue in cellular network, since it affects the system performance, aiming to enhance the signal strengths of serving cells, in addition to reducing the interference levels with the cellular system.

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