James R. Johnson
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July 30, 2010

From: James R Johnson
To: Sanjay Gupta
Subject: FCC

Dear Sanjay,

Thank you for bringing attention to the FCC matter.

James R. Johnson [www.jamesrjohnson.net]

The following is for your review and please feel free to engage further:

The 10 year old compatibility matter between hard of hearing persons and the handset makers could not be resolved by the FCC because at the time industry relied on statements such as "readily achievable" as it related to new antenna technology to reduce the RF signal strength to the head and hand in favor of hearing aids. They had few viable solutions; still have none. The matter is referred to as HAC, Hearing Aid Compatibility.

As a former Director of Quality Assurance for a new high tech antenna firm RangeStar International, I understood the ultimate technology to be phased arrays so I caused as a co-founder, of a new start up, a three year R&D and developed program while patenting and building test prototypes.

With help from the hearing industry who enjoyed successful calls with our prototype, we developed the first interferometric array antenna that forms a figure "8" pattern placing the head within the deep nulls. This reduced signal to the head and hearing aid.

Naturally I knew SAR would be reduced but hadn't prepared for the test coming out of Motorola's advanced R&D group as being an order of magnitude better than the best SAR available [i.e. .7 mW/g was lowest at the time and ours produced .07 mW/g SAR]; an order of magnitude.

We knew it would be valuable in this respect.

I submitted a white paper to the FCC and several letters striking down each of the industry leaders' claims as they presented arguments from every direction imaginable.

We convinced the FCC it was indeed readily available and gave talks in the US, China, Helsinki and the UK as well discussions with telecom engineers as a pre-marketing process to socialize the concept to an industry reluctant to change.

Industry pushed back with counter claims that "directional antennas wouldn't work due to FCC regulations" citing isotropicity rule Part 24.232, 47CFR24.232 based on the assumption that a minimum isotropic standard was required to maintain adequate carrier connection.

With counter arguments by me stating cell phones have been "directional" since "day one" due to head absorption, their arguments failed and the FCC closed this industry question by rejecting our petition to change the regulations.

In a petition I led requesting clarification or change of regulations; the FCC responded with:

In the matter of Section 68.4(a) of the Commission's Rules Governing Hearing Aid-Compatible Telephones; Findings (August 12, 2003):

- (47) "A directional antenna manufacturer, Myers Johnson, Inc. (MJI), has filed a petition for revision of this rule. MJI believes that the rule, as it is written, prohibits the use of directional antennas." The FCC says that "the EIRP requirement does not in any way prohibit employing wireless phone directional antennas." Therefore, the petition was denied (13)

This response was actually a win since no change in regulations were needed and thus countered claims that "antennas need to be omni directional; by regulation; technically; it's an isotropic equivalent measure not a pattern mandate.

This opened the door for new Array Technology; which turns out is actually less directional than omni directional antennas due to elements of interaction since waves propagate outward but also spiral laterally and tend to spread out evenly.

In a wonderful surprise and helpful notice as if the FCC was endorsing our argument; not to mention placing our microenterprise on the global map; the FCC went on to state:

- (46) "Because such antennas have the potential to significantly reduce the RF interference to hearing aids, as well as provide efficiency benefits both to the wireless network and to battery life, there are several benefits that could be gained from their increased use in handsets."

And thus, our Vortis Antenna concept was endorsed as both legal and capable of offering advantages beyond HAC in lowering SAR while offering advantages in signal strength and battery life.

Other areas you may find important can be requested as you need but on the subject of SAR; the following was submitted in my white paper:

> The non-ionizing radiation of surrounding RF fields for a cellular phone along with the conductivity and biological effects from ongoing use have been quantified within biological objects that are exposed to RF fields from cellular devices. The dosimetric quantity called specific absorption rate (SAR) was mandated in 1996 and the SAR values of handsets are posted to the packaging based on FCC compliance testing. SAR is determined by the incident of electromagnetic waves and by the electrical and geometric characteristics of the irradiated subject and nearby objects. SAR distributions are usually determined from measurements in human models or from calculations. Handset makers have implemented several strategies in order to meet regulatory requirements including repositioning the antenna location, using metalized or metal material between the antenna and the user, creating parasitic coupling to control field patterns when next to the head and reducing power output in order to bring SAR to required levels. Many of these strategies result in reducing the effective radiated power performance of the handset.
>
> SAR, as a metric is reported as W/kg or mW/g and testing for SAR entails a well defined set of parameters using an average head and body model as well as a time exposure period. Several factors can effect SAR testing outcomes such as probes, phantom shape, liquid, liquid temperature, operating position, configuration of the handset and system performance. All operating modes are tested and tests are conducted on the center of the band with the output power set to maximum.
>
> The scanned regions must be larger than the areas projected by the handset and the antenna with the distance measured at less than 8mm.

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> Current levels for the U.S. are 1.6 W/kg and 2.0 W/kg for Europe. China is likely to adopt the European standard for SAR but suggested conflicts between regulatory and industry desires.

SAR improvements are readily obtained from a Vortis structure in two ways: 1) there is a natural reduction of half the energy due to the splitting of the output power causing an immediate reduction to SAR of approximately 3 dB. Additional reduction to SAR comes from the 180 degree phase relationship between the elements. The reduction is maximum near the plane of symmetry.

In reality, cell phone antennas radiate the hottest points at the top and bottom

Simulations reflect energy distributions at near fields from a typical brick handset at top and bottom of handset.

The Vortis installed as an accessory or embedded spreads this out in four locations with two hot spots top and bottom each while distributing energy more widely over two elements.

As it turns out, actual tests produced about 1 dB less energy to the head; thus producing 1dB more energy to the cell sites. A factor o f30% more energy saving and placing the Vortis at the top of the charts for any "Green Technology."

"America's First Green Handset"

When considering that the efficiency of moving DC battery thru the phone to produce RF Radiation is only 25% then a 1X's saving from the antenna produces a 4X's saving for the battery. However, in real life the phones move up and down in power so full 4X's savings is too much a claim; we're happy with 50% to 100% more batter life but still needs industry validation beyond the R&D testing facilities.

NOTE: A new scientific discovery about Cell Phones was discovered when testing with a technology partner.

It turns out MORE coverage is delivered with an array than with conventional antennas because of the wave propagation.

Very truly yours:

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