Subject: Fresnel and fibonacci line array systems
Posted by John MacBain on Wed, 17 Dec 2003 15:11:10 GMT
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The following is a copy of some questions and ideas I have been sendind out into cyber space in hope of getting some feed back on, I don't know how to send pic's along with text in these forums for review, but will send to any interested parties, with the intent of seeking help. I am a user/operator of the tools and machines we use to record and amplify sound by, I have been doing this for a large part of my life. In the past I have been more concerned with the how to's, as opposed the why is it school of thought, this was manly due to my need to be successful as a operator with the tools I had available at that time. I always new that one day I would want to know more as to why, because I have always been curious but unsatisfied with the results being achieved by present day technology and theory in this discipline. I have for along time referred to myself as being a sound tech, although this has been changing over the last few years as I have begun to research, and to learn more so I could design and construct some of the tools I use in these endeavors. This is in response to trust issues I had developed over the many years of foolishly believing claims made by manufactures, only to find that these promises would keep falling short of my targets. In the end I have come back full circle, but now I have the real life experiences involving not only how but also what will happen in certain environments under certain conditions. Although I still do not have the ability to explain these experiences to others in a fully common or specialized way, partly this is due to my lack of formal education, and therefore lack of vocabulary both from a mathematical and terminology stand point. Not to say that I am completely ignorant in these areas, as I do understand the basic concepts of signals and wave propagation in differing mediums. I am hoping to find some solutions to some of the issues that have arisen in my pursuit to construct a Line array. I am targeting this system to be capable of being used successfully in many different app's. I am trying to come up with a building block system that in its smallest configuration, can resolves most of the Fresnel equations geometrically, and as the system grows in size, to apply digitally derived solutions. I am also trying to marry these Ideas with Fibonacci sequences in an attempt to deal with phase and time issues in more natural ways. I hope to have completed construction of this system by this spring. I did not intend originally to go this route, I just can't seem to quell my imagination in these areas. I offer the following system description for review and in an attempt to explain what I have in mind, but first I will explain some of the reasons why I am leery going with one of the bigger corporate manufactured rigs. 1. From what I have experienced personally so far in using and listening to this technology, it has not been at the level of consistency and flexibility that I would like to see. Example: V-DOSC system at the Commodore Ballroom, Vancouver, B.C. This system has a big null or is it phase cancellations I don't know, but I can certainly can attest to the results, and the do's and don'ts on being able to enjoy a show in this venue. One should never be front stage center, until one stands back at least 10 m, or one will never hear uniformed sound or feel the impact generated by this system. Granted in my humble opinion this would probably be resolved by shortening the distance between the L/R stacks, but then there would be sight line issues to contend with. 2. Manufactures are not providing clear and concise objective info regarding their arrays and components, when I dig, they often ask why instead of answering my questions, I get the feeling that they don't want to provide these answers. I remember a time when manufactures seemed more inclined to educate their potential users. 3. Individual enclosures can not be used for any other applications, Arc's are an exception to this as they allow the HF unit to be turned 90 degrees with this in mind. Then of course their is the issue of minimum # of Box

requirements being at least 4-6, and this is being dictated by the low end line length needed. 4. From my calculations concerning required line lengths, I am of the belief that logarithmic spacing is the way to go, I was glad to see that Duran is using these ideas, but I would love it if, Fibonacci series could also be included with in this 1/2 wavelength spacing concept, as I wonder if this might among other things, give more vertical control over the array. I could go on and on, but will stop here and move on to what I have been doing in this area and where I am running into difficulty, first I ask that you look at the attached file to see a picture of my purposed system with geometrical lay-out options for different app's. Ports and sub enclosures are omitted for simplicity. I have taken the point of view that Vertical arrays should include some horizontal options in exploiting how we are more sensitive to horizontal cues. To go along with this drawing, I have supplied the following information, I do not want to bore you with to much so I have omitted many details in this effort, but will supply more if interested. I am using Stage Accompany SA 8535 Ribbon drivers on my own custom 90/30 degree waveguides, I have chosen to go with waveguides for many reasons, but number one is the extra sensitivity and coupling blendabilities. Drivers will be spaced, optimized to 1 wavelength @ 10 KHz, as this is as close as they physically can be spaced. I except that many would argue putting ribbons on a waveguide is a no no, but I think they can be used effectively, if properly addressed. JBL 2250HPL's for the MF, I wish I had gone with a 6.5 made by anyone else besides JBL as they have been nothing but a pain in the ass, but this is my own fault for not researching better before committing. I would like to find out more on the math required to make Isophasic apertures to be used on these elements so I could raise the upper crossover point up to around 3 KHz. As it stands right now my upper point is 1690 hz and my lower point before adding more "add-in modules" is 214 hz capable, but I intend this point to be around 300 hz. Eminence Omega 12's for the LF, as I already blew my load on the HF and MF where I believe are of greater need for quality components. The next info I am providing is a copy of a email I sent to a person named Alex Meggen, as I had read an article by him regarding irrational numbers and their implications to element lay-out in enclosures. This helps explain a little more as well as being full of questions. I found your paper on irrational numbers and their implications towards enclosure designing very interesting and enlightening. So I was wondering if you could/would or maybe knew someone that might help me in my quest to; figuring out how these ideas can best be incorporated towards motor spacing under the following conditions. When; not only when applying these ideas to individual enclosures and motors, but when we want to expand these ideas to line arrays. I have been playing around with some interesting designs concepts concerning the geometry of enclosures and motor spacing, combined with 1/2 wavelength element center to center spacing to achieve (among other things) frequency responses and the upper slopes of their associated passband, as well creating the proper line heights required to achieve the lower slopes of that passband.....blah blah. I want to figure out, how to geometrically space the low end transducers where I want to apply irrational numbers geometry, as well balancing the line array requirements of the elements ½ wavelength center to center spacing. This allows me apply the necessary line array calculations to optimize and create the upper crossover slopes. Which in this example; we will only be concerned with the 314 mm LF transducers and their ½ wavelength spacing, which I have worked out to be 519.5 mm to where the upper crossover slope is derived and optimized to, in this case is 330hz, and by the over all line of this passband which in my case is geometrically adjustable in height vertically. From my target starting minimum line length of 2078 mm, with next geometrically tunable LF array configuration options being @ 3117 mm and then 4156mm. Allowing for three different lower crossover slopes for the LF being derived by the over all different LF line lengths created by this ½ wavelength spacing and arrived at from being: 2078 mm = 123.4 hz, and then 3117 mm = 110 hz, and then 4156 mm = 82.54 hz when applied to enclosure lay out viewed from a vertical

perspective. This can be seen along with enclosure dimensions in the pictures at the end of this email of some of the many different 3-way systems set up options available. Please understand that mixed along with these geometrical physical processes, that I will also be applying digitally derived at beam steering solutions, directed towards these individual passbands in many synergistic fashions. System application target of the 500 – 2000 seat venues, ports and sub enclosures omitted for simplicity.. To conclude I am hoping to find some one who can do the irrational numbers math and find the natural sizes and places for these LF elements that would also take into account and work with and in the ½ wavelength spacing requirements as well. I can make the enclosures front height and width 70 mm smaller if needed to be in conformity to make everything irrational. I would also be willing to adjust the upper crossover point if required to help achieve this. There are so many variables here and changing one changes every other relationship and I don't have the math or what ever program their might be to help one in this task. Any leads will be most appreciated. Thanks Dear John,Thanks for your fascinating mail. I will need to re-read it over theweekend, but I wonder whether what you're looking for is a Fibonacciarray. This has two intervals, one related to the other by the goldenratio, and alternated in accordance with the Fibonacci sequence: A AB A.AB AB.A.AB A.AB.AB.A.AB AB.A.AB.A.AB.AB.A.AB and so on ...I have been thinking about using this for a line array for years, butother projects and domestic responsibilities always got in the way. Asfar as I know this has never been applied commercially.I'll read your post again and get back to you next week.Regards,AlexCheersHello again Alex, I am glad I am not alone in these ideas, the attached file visually explains what I am trying to achieve with in the constrains of this proto type system, I have got to tell you, this project has grown ten fold since I first decided that I wanted to build my dream P.A. system. Which eventually brought me to the point (long hard road) where I found myself disseminating commercial line array architectures to see what was being accomplished, and found to my amazement that they were incorporating way to many elements in their designs to create the required line lengths and all of the passbands being dictated by their LF passband. I then realized that these unnecessarily long MF & HF line lengths were having to be dealt with any ways, by various digitally derived at beam steering solutions. I just thought this is stupid, why not have the passbands lengths and spacing be in accordance with the natural frequencies lengths expecting to be produced with in the passband, exploit them. Its no wonder they have achieved such limited success in smaller and wider venues, besides I want my base system to be a simple, geometrically aligned systems, that only require more complex algorithms to be applied when I desire to create more complex systems that can be applied to complex situational requirements. Thanks for listening as I have so few to talk to about these things, and will appreciate any input. CheersJohn Macbain