A. Discrimination Is Feasible.

The parties themselves acknowledge their "ability to offer local promotions for installation and equipment" and that they have offered local promotions in "a handful of areas..., due to localized, specialized reasons..."[90] While they claim that such promotions will not undermine national pricing, it is difficult to see why they cannot do so. Installation and equipment are offered locally and prices could easily be varied by locality for both.

Further, Dr. Willig argues that Pegasus sells DIRECTV service in its territories for $3 more than DIRECTV charges in its territories, but that EchoStar charges the same price in both Pegasus and DIRECTV territories, allegedly proving that price discrimination is inefficient.[91] But, assuming the accuracy of his rendition, Dr. Willig proves too much – in fact, he proves that it would be quite feasible for New EchoStar to charge $3 more in rural markets. If Pegasus can identify such customers, so can the merged company.

Perhaps the simplest method of discriminating against rural subscribers in non-cabled areas simply would be to offer a discount ("six months free") to anyone who mails in their cable bill.[92] EchoStar has offered this type of program in the past[93] and there is no reason it could not be done again in the future on a larger scale.

Simply reviewing recent developments demonstrates the difficulty with truly uniform national pricing. For instance, "consumers who live in smaller DMAs have already voiced concerns that they don't want to pay $5.99 to receive less than a full complement of network

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[90] Opposition at 69, 71.

[91] Willig Declaration at ¶ 93.

[92] Sidak Reply Declaration at ¶ 45.

[93] Dish Network Announces Unbeatable Deal, BUSINESS WIRE, March 11, 1998.

affiliates, let alone for the dozens of channels broadcast for very large markets like Los Angeles".[94] Similarly, DIRECTV is making YES, the new New York Yankees network, available as part of its Total Choice® monthly service to customers living in the Yes Network footprint, in and near New York City. However, in other areas, YES' Yankee games will be carried on the DIRECTV SPORTS Pack, a completely different program package, with its own pricing.[95] It may well be that these programming decisions are reasonable, but they certainly are not a uniform national offering and lend themselves to disparate treatment of different groups of customers. It should be emphasized that economic theory predicts disparate or discriminatory pricing where levels of competition differ. In other words, one would expect that a rational company situated like a post-merger New EchoStar would charge more in rural monopoly areas than in urban duopoly settings. Therefore, the result can only be avoided with iron-clad "utility" type regulation, which is impossible in this setting for the reasons described above, among others.

B. EchoStar Acknowledges That National Pricing Is Unworkable and Insists on Exceptions.

Even EchoStar's own words testify to the unworkable nature of a national pricing plan. The parties tout their "one rate card" plan to mean that "customers in rural America can rest assured that they will continue to pay the same monthly rate as customers in big cities where

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[94] *Ergen Asks Dish Subs to Support Merger*, MULTICHANNEL NEWS, March 18, 2002, at 17.

[95] DIRECTV Press Release, "YES Network and DIRECTV Announce Network's First Distribution Agreement" (Feb. 5, 2002) <http://www/directv.com/DTVAPP/aboutus/headline.jsp?id=02_05_2002A> (visited Apr. 18, 2002).

competition with cable companies is more prevalent."[96] Yet in a December 2001 interview, Mr. Ergen explained that the merged firm, even with "rate regulation" from the federal government, would need to be able to price discriminate by locality: "if somebody comes in and offers a $300 rebate to get your customers in a particular location, then you have to have the ability to respond to that."[97]

In their Opposition the Applicants make clear that their "national" pricing plan encompasses the loopholes described by Mr. Ergen:

> ...the effect on the profit-maximizing national pricing level would be negligible if New EchoStar were to offer in the first year of its operations only promotions of the same scope as those EchoStar and DIRECTV offered in the past. Indeed the Applicants are willing to commit to reasonable requirements to ensure that national pricing is an effective constraint on pricing behavior, **consistent with efficiency and market dictates**.[98]

In other words, what the parties really want is a flexible national rate system – overseen by the government – where rural consumers will pay the same rate as their urban counterparts unless the DBS monopolist needs, "consistent with efficiency and market dictates," to lower rates to match cable promotions in urban areas.[99] The Commission should recognize the Applicants' scheme of government oversight as unworkable and unenforceable, and embrace Mr.

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[96] EchoStar merger website <http://www.echostarmerger.com/5030/wrapper.jsp?PID=5030-11> (visited Apr. 18, 2002).

[97] *Ergen Makes His Case*, SATELLITE BUS. NEWS, Dec. 31, 2001, at 11.

[98] Opposition at 71 (emphasis added).

[99] Willig Declaration at ¶ 93 n.110.

Ergen's earlier call to "move away from 'the monopoly oriented, over-regulatory origins of communications policy.'" [100]

C. A National Price Would Be Above the Competitive Level.

Regardless of the impracticality of national uniformity, the parties claim the uniform national price would be based on urban competition with cable providers. This necessarily means that with only two MVPDs in an urban area – the merged firm and a cable company – DBS pricing would result from a duopoly, not from competitive pricing influenced by another DBS provider.

Further, as Mr. Sidak explains – and Dr. Willig does not contest – the "profit-maximizing national pricing level" that the Applicants admit they will charge would be above the duopoly price in urban areas.[101] The reason is that the profit maximizing DBS firm would price at some point between the urban duopoly price and the rural monopoly price.

D. A Uniform National Price Would Make Coordinated Behavior Easier.

The parties argue that collusion between the merged firm and cable operators is not likely because coordination would have to occur with "as many as 10 cable MSO partners simultaneously."[102] In reality, following approval of the AT&T Broadband/Comcast merger, the top four MSOs would account for 70 percent of all cable subscribers and nowhere do they

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[100] *Competition to Cable: Hearing Before The Senate Commerce Committee* (July 27, 1998) (statement of Charles W. Ergen) (quoting Michael Powell, *Communications Policy Leadership*, 50 FED. COMM. L.J. 529, 534 (1998)).

[101] Sidak Reply Declaration at ¶¶ 51-52.

[102] Opposition at 76.

In neither their initial Application nor their Opposition have the Applicants produced any credible evidence or analysis to support the positions they advance. By failing to do so, they fail to meet their burden under the public interest standard.

The Commission should reject this anticompetitive merger and allow these two highly successful companies to continue the fierce rivalry that has promoted their meteoric rise in the MVPD industry.

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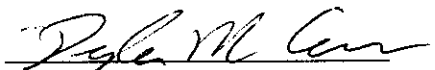
April 25, 2002

Certificate of Service

I, Dylan M. Carson, do hereby certify that on the 25th day of April, 2002, I caused true and correct copies of the foregoing Ex Parte Reply to Opposition of the National Association of Broadcasters to be served via courier and, as indicated, electronically upon the parties on the attached service list.



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anecdotal evidence suggests the comparable price for 2001 was likely some 50% lower. A price of $50 has been used for 2001.

[2] Quality improvements during these years in either cable television (more channels and upgrades to digital service) or DBS service (more national channels and increased availability of a local station viewing option for local subscribers) have not been taken into account.

[3] These calculations are based on the annual U.S. city average cable television CPI.

APPENDIX B

SUPPLEMENTAL DECLARATION OF RICHARD G. GOULD

The Declaration of Richard J. Barnett in behalf of EchoStar Communications Corporation, General Motors Corporation, and Hughes Electronics Corporation disputes the accuracy of several technical points made in my original Declaration on behalf of the National Association of Broadcasters. Dr. Barnett is mistaken. The points in my original Declaration are sound, and the techniques to achieve the higher DBS capacities they describe are feasible, practical, and are either here now or imminent.

As I explained in my original report, the already-accomplished technical achievements of *DirecTV and EchoStar themselves* show that each company could individually carry all of the local television stations in the United States, while having plenty of capacity left over for their current national programming (and more). In this Supplemental Declaration, I independently derive an estimate of transponder capacity and frequency re-use factor and hence the number of "carry one, carry all" local TV stations that EchoStar and DirecTV could provide independently.

A detailed DBS satellite system design would be required to predict the specific number of local stations that could be carried by each operator independently, but the estimate derived here, based on average conditions, is large enough to insure that all of the 1467 eligible local TV stations could be carried, taking into account differences in the number of eligible TV stations within each DMA and the irregular shape of DMA's.

Frequency Re-use Analysis

By using spot beam technology, it is possible to re-use the available frequency spectrum over CONUS many times. The size of the beam is determined by the satellite antenna reflector

size and the downlink frequency. The half power beamwidth is conveniently estimated by the formula

$$HPBW = \frac{21^\circ}{f\,D}$$

where f is the frequency in gigahertz and D is the antenna diameter in meters. For example, the DirecTV 7S satellite employs a downlink antenna reflector that is 3.5 meters in diameter. Thus at the Ku-band downlink frequency of 12 GHz, the beamwidth is 0.5° as assumed by Morgan (pp. 24 – 25). As shown in *Figure 1*, the Contiguous United States (CONUS) can be covered by a hexagonal array of 65 spot beams each having a beamwidth of 0.5°.

Spot-beams having sufficient spatial separation can share the same frequencies. To avoid self-interference, it is desirable to keep the separation as large as possible. *Figure 2* illustrates a seven-beam hexagonal cluster design, as described in the Barnett declaration (pp. 29 – 30). Beams sharing the same frequency, labeled with the same number, are separated by nearly two full beamwidths and each beam is surrounded by six beams using different frequencies. As acknowledged in the Barnett declaration, this cluster design provides a more than adequate level of beam separation to ensure an acceptable level of isolation between beams sharing the same frequency.

Dr. Barnett states that a cluster of three and four beams are impractical because the self-interference would be too high, and sets the minimum cluster size as one that provides at most two full beamwidths of separation for re-use of the same frequency. But that conclusion is too conservative by far. For example, Intelsat VI, using 20-year old technology, has 160 beams, each with a 3 dB beamwidth of 1.6 degrees; these co-frequency beams form shaped Zone Beams that are separated by only 1.4 times the individual beamwidths. That means a five-frequency

group re-use scheme would not have unacceptable self-interference and would permit a higher overall frequency re-use factor than assumed here.

The detailed design of the Astrolink satellite is an example of current beam generation technology. In that design, one-degree beams are arranged in clusters of four, without incurring unacceptable self-interference (that is, inter-beam interference).

Frequency re-use factor.

With a hexagonal array of 65 beams over CONUS and a beam cluster size of 7, the frequency re-use factor is 65/7 = 9.2. This means that there are 9.2 beam clusters covering CONUS and that each beam within the cluster shares the same frequency with the corresponding beam in other clusters 9.2 times from a single satellite orbital slot. With the same beam configuration from two orbital slots, the re-use factor would be doubled to achieve a frequency re-use factor of 18.4. Therefore, Dr. Barnett's statement (Note 25 on page 22) that my estimate of a frequency re-use factor as high as 10 has no basis is incorrect. The above analysis shows that a factor of almost 10, that is 9.2, can be achieved from a single satellite. Furthermore, a factor twice as great, that is 18.4, is possible from two orbital slots.

Here too, again even assuming no improvements from the obsolescent technology of Intelsat VI, the assumption of sixty-five beams used here is an overly conservative number for a 12 GHz Ku-band DBS satellite with a 3.5 meter diameter transmitting antenna. Intelsat VI generates 160 beams of 1.6 degree diameter which it combines to produce its shaped Zone Beams.

Bandwidth.

For a given information bit rate R_b, the required bandwidth B is given by

$$B = k\frac{R_b}{m\,r}$$

where k is the spectral shaping factor, m is the number of bits per symbol, and r is the code rate. Assuming 20 percent raised cosine filtering (k = 1.2), QPSK modulation (m = 2), and rate 3/4 forward error correction coding, this equation implies $B = 0.8\ R_b$. With modern compression[1] techniques, the required average information bit rate for a standard NTSC television channel is between 2.5 Mbps and 3.0 Mbps.

The individual television channel data streams are combined to form a single data stream by the process of multiplexing. By using a single carrier, the transponder can be operated at maximum power without incurring intermodulation effects among individual channels and the bandwidth utilization can be maximized by eliminating the need for guard bands between channels. The data rate for a particular channel depends on the level of detail in the TV picture and changes with time. Through the technique of "statistical multiplexing," the instantaneous information data rates of the individual channels can be varied dynamically in real time to allocate bits where they are most needed. The value of 3.0 Mbps or less is an average, which has been well established in the industry. Furthermore, the satellite operators can organize transponder channel content to provide a mix of high data rate and low data rate channels to optimize the transponder capacity. By stating that a transponder channel capacity of 12 "is not possible for all types of TV programs, depending on their picture content" (p. 10), Barnett seems to assume that the same data rate is assigned to every channel, thus not recognizing that the assumed data rate is an average over all channels and ignoring the use of statistical multiplexing.

The bandwidth of a DBS satellite transponder is 24 MHz. With a data rate of between 2.5 Mbps and 3.0 Mbps, the required bandwidth per channel is approximately between 2.0 MHz

[1] The term "compression" refers to the reduction in the necessary information bit rate achieved by exploiting both spatial and time redundancies in the TV picture content. The information bit rate of an uncompressed NTSC digital signal according to the ITU-R Rec. 601 standard is 216 Mbps. Through compression, this high data rate can be reduced to approximately 3.0 Mbps on average, depending on the information content of the TV picture.

and 2.4 MHz. Therefore, with industry standard QPSK modulation, the transponder channel capacity[2] is approximately between 10 and 12 NTSC television channels. A capacity of 10 NTSC channels per transponder is a conservative estimate that is acknowledged in the Barnett declaration (p. 9) as an achievable level today. A capacity of 12 NTSC channels per transponder is not only possible, but is acknowledged (p. 10) to be in use by both DirecTV and EchoStar in selected regions. Improvements in compression, coding, and statistical multiplexing techniques will continue to enhance the practicality of this level of capacity.

Further confirmation of the expected increase in the number of typical TV programs that can be multiplexed into a single digital carrier, and carried in one transponder of a DBS satellite without degradation of video or audio quality was provided just recently at the 2002 television trade show in Las Vegas, Nevada. The consensus expressed there by the leading manufacturers of the encoding, pre-processing and multiplexing equipment used by DBS broadcasters is that 11 programs per transponder is available now, and that another 10% improvement would be achieved in another 18 months, resulting in the ability to carry a mix of 12 typical programs on a single transponder.

Dr. Barnett is mistaken when he states that "Petitioners appear to have ignored the fact that approximately 20% of the available bandwidth on every transponder in the network is needed for non-video purposes....The compression systems require available 'headroom' within the overall bit stream within every transponder...to perform their compression and multiplexing functions...and one transponder at every satellite location includes a complete Electronic Program Guide [requiring] one third of the available capacity of [the] home transponder."

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[2] The term "transponder channel capacity" refers to the number of NTSC television channels that can be transmitted in a single transponder frequency bandwidth. The unfortunate use of the term "compression ratio" by Barnett and

On the contrary, only about 1.9 MB/s out of the total transponder bit rate capacity (not bandwidth as Dr. Barnett has argued) of 27 MB/s is required for "overhead." That is, Conditional Access messages (ECM's and EMM's) require about 1.45 MB/s, while Program Specific Information requires less than 0.5 MB/s. All told, that overhead takes up only about 7% of the capacity of a transponder. The stereo audio accompanying each video channel requires only about 0.128 MB/s. Additional stereo radio channels also require only 0.128 MB/s. The Electronic Program Guide requires about 4 MB/s, but it is transmitted on only one transponder of the satellite at each location.

Further improvements are achievable from such techniques as better QPSK modulator designs which provide better discrimination between the four quadrature states (which would permit the use of less error correction coding and hence increase effective capacity).

Required number of frequencies.

There are 1467 local TV stations distributed among 210 DMAs. The average number of stations per DMA is 1467/210, or approximately 7 stations per DMA. Assuming that 65 beams are required to cover CONUS, the average number of DMAs per beam 210/65, or approximately 3 DMAs per beam. Thus there are on average about $7 \times 3 = 21$ stations per beam.

If the transponder capacity is conservatively assumed to be 10 NTSC channels, the number of transponders required to provide all 1467 local TV stations is 1467/10, or 147 transponders. With a frequency re-use factor of 9.2, the resulting number of required frequencies is 147/9.2 or approximately 16. If the transponder capacity is 12 NTSC channels, the required number of transponders is 1467/12 = 122. With a frequency re-use factor of 9.2, the required number of frequencies is 13.

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some other authors is incorrect, as the term "compression" refers to the reduction in information bit rate by exploiting redundancy as explained in Note 1.

The typical transponder RF power is 100 W. The total RF power required is thus about 15 kW. However, as the typical amplifier efficiency is on the order of 50%, the total payload power required is roughly 30 kW. Therefore, it would be reasonable to assume that two high-power satellites at a single orbital slot could provide coverage for all 1467 local TV stations. In practice, the coverage might be allocated among several satellites to optimize transponder bandwidth and power for both local TV stations using spot-beams and national coverage using CONUS beams.

It should be emphasized that these frequency and power estimates are approximate values to demonstrate the feasibility of providing all local TV channels with existing satellite technology. A detailed analysis is necessary to take into account variations in the geographical size and shape of the DMAs, and the number of TV stations per DMA. However, since most of the individual assumptions used in this analysis are highly conservative, the actual number of local TV stations that could be carried through a detailed design will be at least the 1457 needed to serve all 210 US DMA's.

Use of higher order modulation.

In the past, satellite communications systems were constrained by the level of power available on relatively modest satellites. However, with the development of modern high power satellites, available power is no longer nearly as important a constraint. Therefore, there is a significant trend toward better spectral efficiency using higher order forms of modulation.

With 8PSK modulation, there are 3 bits per symbol instead of 2 bits per symbol as with QPSK modulation. Consequently, for a given data rate R_b, the required bandwidth using 8PSK is 2/3 the bandwidth using QPSK. The permissible data rate R_b for a given bandwidth is

$$R_b = m r \frac{B}{k}$$

Since m = 3 for 8PSK and m = 2 for QPSK, the information bit rate using 8PSK is 3/2 the information bit rate using QPSK. Thus 8PSK affords a 50% increase in information data rate. Therefore, the resulting transponder capacity is between 15 and 18 NTSC channels using 8PSK modulation.

The tradeoff for reduced bandwidth using 8PSK modulation is higher power. Compared to QPSK, the power required with 8PSK is about 3.5 dB higher for a typical bit error rate. This value corresponds to an increase in power by a factor of 2.2. That is, 8PSK requires somewhat in excess of twice the power as QPSK (p. 14). The use of sophisticated methods of coding, such as turbo codes combined with 8PSK trellis-coded modulation, can reduce the power requirement without materially increasing the necessary bandwidth.

While satellite power was indeed at a premium in past years, the evolution of satellites has made the possibility of using 8PSK and other spectrally efficient methods of modulation a practical reality. Therefore, it is likely that in the near future even greater transponder capacity using more efficient methods of modulation will be realized because of the growth in satellite power.

Conclusions

Barnett (pp. 1-2) summarizes three criticisms of the Petitioners' arguments. First, he states that the capacity estimates rely on unproven or impractical improvements to technology. On the contrary, we have shown that using beams produced by a typical existing satellite antenna reflector and Barnett's own example of a valid beam cluster design that a frequency re-use factor of 9.2 could be achieved from a single orbital slot and that the entire population of 1467 local TV stations could in principle be provided using only 16 frequencies, even if one assumed carriage of only 10 stations per frequency. And even if one assumed that

the DBS firms merely replicated the relatively low 7.33 re-use rate that DirecTV achieved with the D 4-S satellite, each firm could carry all 1467 local TV stations with only 17 frequencies (assuming carriage of 12 stations per frequency).

Second, Mr. Barnett challenges the satellite design concepts. In fact, the analysis has been (conservatively) based on existing satellite technology. The Boeing 702 satellite, for example has a total power of 15 kW and can carry 100 transponders. Two 702 satellites at a single orbital slot could provide the bandwidth and power required to provide service to all 1467 local TV stations.

Third, Mr. Barnett criticizes the emphasis on local programming at the expense of future national programming. But that criticism misses the point. It is tautologically true -- but uninteresting -- that a DBS firm could carry larger quantities of one type of programming if they carried less of another type of programming. But as I showed in my previous Declaration, and as this Declaration confirms, each firm has plenty of capacity to carry all of its existing national programming, all local stations, and even some new national programming, without relying on any new technologies. And with use of such advanced techniques as 8PSK, each firm could carry still more.

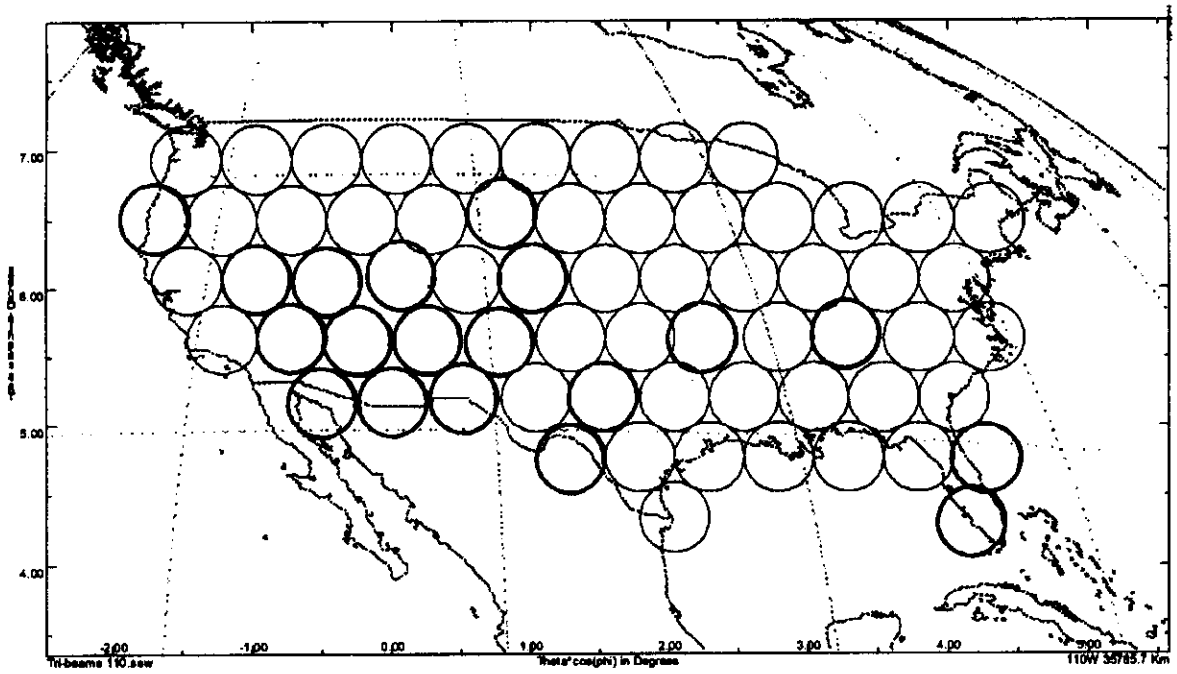

Figure 1. CONUS covered by 65 0.5° beams (adopted from Morgan declaration, Figure 5, p. 25).

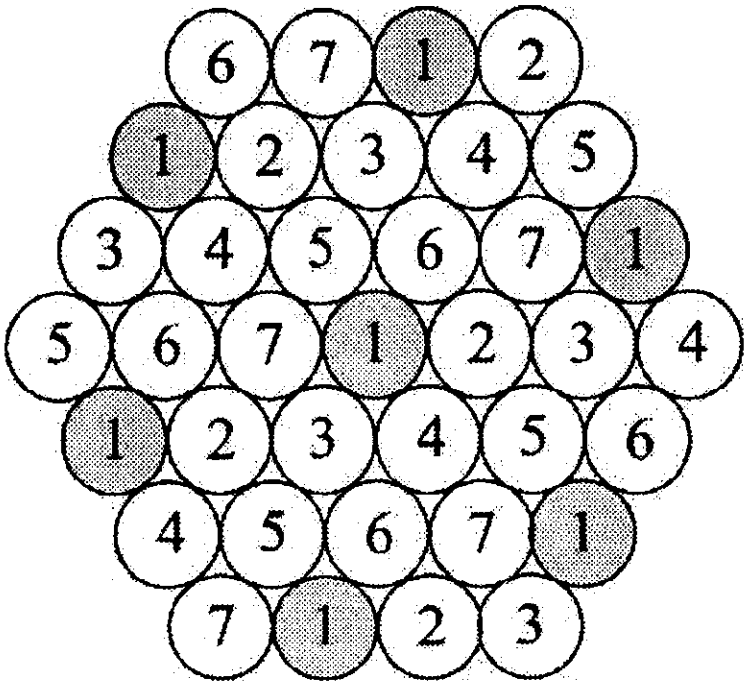

Figure 2. Seven-beam frequency re-use cluster (after Barnett declaration, Figure 4, p. 30).

I hereby declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Richard G. Gould

Executed April 15, 2002.