Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Extending Wireless	)	WT Docket No. 99-266
Telecommunications Services	)	
To Tribal Lands	)	
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COMMENTS OF THE NATIONAL SCIENCE FOUNDATION WIRELESS FIELD TESTS FOR EDUCATION PROJECT:

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The FCC should, for a change, work backward from the desired ultimate result - which I take to be to extend affordable telephony AND 'appropriate bandwidth' data communications to every abode on Indian lands and to further connect those to the outside world, the PSTN and to the Internet - to the changes necessary in FCC rules for technical characteristics, radiated power, spectrum utilization, tower and antenna placement, and deployment, of the minimum number of wireless devices required to accomplish that end.

Unlike abstract generalizations about the 'whole United States' with the density of population and electromagnetic environment made possible by myriad wireless services in urban areas (worst case assumptions for FCC rulemaking)the number of Indian lands - legal Reservations - their geographic boundaries, distances between any two points within them, the specific number, size, and placement of abodes - including individual homes, organizational buildings, schools, tribal facilities, businesses, and the number and per square km density of Native Americans who live there, and where they live, and the geography, is readily calcuable, discernable, and plottable on maps. It does not take a rocket scientist to determine from that, for each reservation and tribal population singularly, the distance that wireless devices must communicate from either singular central locations, or a backbone network of base stations, and at what bandwidth and radiated power required to serve for the forseeable future those homes or facilities reachable by those data radios.

As a concrete example, my rough analysis of the Pine Ridge Indian Reservation of South Dakota consists of an L shaped rectangle, approximately 40 miles in width through out its 90 mile length. That simply means that data radios with 10mbps or higher bandwidth, capable, by radio power plus amplification power at either omni or directional antennas, communicating

reliably for 20 miles from a center line of towers, could reach virtually all abodes on the reservation.

However the Navajo Reservation in Arizona is much larger in both area and dimensions, and would require a network system of either microwave towers or satellite to ground stations or both, to provide access points from which the 'last 50' or more mile wireless distribution systems could operate. And each local link would have to carry the bandwidth necessary to serve all residents within those areas.

If a systematic study would be made - requiring the contract services of demographers and geographers I am sure - it would be a relatively straightforward task to assess, and average, the requirements for bandwidth, telephony, range, and obstacle penetration or avoidance (relay) to state the 'requirement' with some exactitude so that industry providers could state to the FCC, what spectrum, power, antenna, or type-FCC-service relief is required for them to supply the ultimate
connectivity and as what competitive costs.

The telephony for Indian lands should be, from the start, conceived of in data forms - Voice over IP - and thus integrated, not made a seperate system from, data communications. VOIP is already mature enough to be considered, in low density enviroments such as are the norm for Indian reservations, as the telephony of choice. And delivered wirelessly, with a priority to Part 15 spread spectrum no licence forms of delivery.

At this point in wireless technological development, currently constrained ONLY by FCC rules which are promulgated to minimize problems in the densest urban areas, there would seem to be absolutely no reason to consider the deployment, or subsidy, of wireline solutions - certainly not from typical RBOCs - most of whom have made strenuous efforts to avoid being required, without fat government subsidies, to serve such underserved areas as tribal lands. However the FCC will be required to make such rules as to require RBOCS providing basic telephone services in areas adjacent to Indian lands, to accept with fair compensation and no punishing contractual hold-up conditions, the interconnection of VOIP dial-tone services to the Public Switched Telephone Network. So long as a local, or long distance carrier is under FCC and/or PUC regulation, the FCC, as part of this action, must insure that companies, whether formed as CLECs or private telephone/data services, which are willing to extend telephony and data services across Indian lands at the low costs inherently made possible by advanced wireless, particularly Part 15, connectivity, are not forced by usurious conditions or rates, not to provide their services that public policy here is attempting to provide for.

As a researcher for a series of National Science Foundation wireless field tests, and as a private contractor, who has worked primarily on connectivity problems for very rural, remote, small communities, and their schools, including on Indian reservations, I have long been an advocate for wireless solutions to their connectivity problems. And I have, as part of NSF Wireless Field Tests for Education projects, demonstrated how practical and cost-effective such solutions can be. There is great potential of Part 15 data radios to provide that connectivity. That is even more true today, than when my projects were able to deploy 115Kbps, and 2Mbps radios in rural areas to 10-15 miles of range, - where they were only limited in range by FCC power and antenna constraints, yet could compete with telephone company T-1 wireline solutions demanding from $1,000 to $2,000 a month recurring costs. While the Part 15 radios could deliver the same bandwidth for zero recurring costs between the ISP location and a rural distant

school or town. If the power and antenna rules were made right, there would be far less requirement to rely on far more expensive Microwave to span those 'last 50 miles' stretches. The current generation of radios, which can operate at 11mbps up to 25 miles, could, with permitted power amplification, reach the 50 or more miles from a base ISP, or satellite ground station, needed to distribute both Internet data and small bandwidth-requiring VOIP traffic to the edges of Indian Reservations, at cost effective rates.

There absolutely should be permitted the experimentation of software controlled data radios, which are capable of listening for transmissions, setting their own power levels, route traffic through a network of radios, and dealing with interference. The time is already past when the FCC should encourage, not just reluctantly tolerate, 'smart radios' and 'smart antennas' as a strategy to get the most out of such radios, with the minimum interference.

As part of the experimentation, wide and lower (than the line-of-sight) frequency band utilization should be generously permitted. Wide Band radio development should be encouraged. And out of the testing and deployment of advanced radios on Indian lands can come the compromises necessary for rule making if these radios can be used in denser electromagnetic environments. It is not a well understood - by the FCC - problem, but the stringent limitations imposed by the FCC on 'field testing' of data radios - the only way they can be really progressively developed, has been an inhibitor to the revolutionary development of radios which have great applicability to the problem of rural, and high cost connectivity.

In summary, the FCC should concentrate on granting rule relief for wireless data and VOIP radios, in terms of power, width of spectrum bands, antenna characteristics, tower placement, and self-regulating software control of radios for devices deployed on tribal lands. It should view the attempts by the wireless and telephony industry to bring affordable connectivity to tribal populations as a large experimental test bed for advanced radio technologies, and grant exceptions to rules on that basis. But, in awarding specific licences to telephony communications services seeking to operate on those tribal lands - the goal should be clear and uncompromising - that the vendor or service, to get the licence or relief, must provide both 'appropriate' data rates (from T-1 up) and voice, to every abode in its permitted operating area.

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