Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Improving Public Safety Communications in the 800 MHz Band	)	WT Docket No. 02-55
	)	
	)	
Consolidating the 900 MHz Industrial/Land Transportation and Business Pool Channels	)	
	)	

To: The Commission

COMMENTS

Respectfully submitted,

PALOMAR COMMUNICATIONS
RAGAN COMMUNICATIONS, INC.
BELL INTERCONNECT, INC.
SKYLINE COMMUNICATIONS, INC.
MOTIENT COMMUNICATIONS, INC.
COMMTRONICS OF VIRGINIA, INC.
WESTERN COMMUNICATIONS, INC.
WS ELECTRONICS, INC.
G & P COMMUNICATIONS
KLL WIRELESS, INC.
CNY, INC.
WILLIAM J. YOUNG
PETE'S COMMUNICATIONS, INC.

AERONAUTICAL RADIO, INC.
UNITED AIRLINES, INC.
NORTHWEST AIRLINES, INC.
NORTH SIGHT COMMUNICATIONS, INC.
JPJ ELECTRONIC COMMUNICATIONS, INC.
SID RICHARDSON ENERGY SERVICES CO.
INTEL CORPORATION
NEW YORK COMMUNICATIONS COMPANY
SR COMMUNICATIONS ASSOCIATES
COMMUNICATIONS AND INDUSTRIAL ELECTRONIC CORPORATION
WECOM, INC.

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SUMMARY

In this proceeding, the Commission is attempting to resolve interference to 800 MHz public safety systems. The Joint Commenters applaud this goal. However, the Commission should not be distracted by other agendas from a variety of parties in this proceeding. The Commission's focus must strictly be on resolving interference in the best manner possible for all parties. The Joint Commenters do not object if any of these other agendas are met as a natural consequence of the Commission determining the best means to resolve interference. However, such agendas cannot and should not be the focus of this proceeding.

While the Commission's focus should be on resolving interference in the 800 MHz band, the Commission should be aware that non-public safety systems in the band are also experiencing interference. Many of these non-public safety systems are SMR systems, with public safety agencies as their customers, and internal-use systems with significant public safety functions. These systems deserve interference-free operation as much as any public safety system. Thus, resolutions to interference must be found for all licensees in the band.

The Commission's Rules are abundantly clear on the resolution of interference. Parties causing interference, despite their compliance with the terms of their authorizations, must eliminate that interference at their own cost. Thus, the Commission has ample authority to require Nextel, as well as Cellular A and Cellular B licensees, to correct the interference they are causing on a case-by-case basis, and at their own cost.

If the Commission determines that it must find a regulatory solution to interference in the band, and determines that all licensees should remain in the 800 MHz band, the Joint Commenters endorse and support the modified NAM/MRFAC proposal submitted by the Private Wireless

Coalition. However, the Commission should be aware that, while separating cellularized systems from non-cellularized systems will help to resolve some interference, true relief will not be achieved until new radios with narrower "front ends" have been manufactured and implemented.

In adopting the modified NAM/MRFAC proposal, or any other proposal, it is paramount that incumbent licensees who are not causing interference be compensated for any re-tuning or new equipment resulting from adoption of the proposal. There is no precedent in the Commission's Rules for the imposition of the cost of re-tuning on incumbent licensees who are receiving interference, and such a requirement will literally bankrupt many small businesses which continue to operate in the band.

The Commission must also recognize that any regulatory solution will take time to implement. Therefore, during the transition period, the Commission must continue to enforce its Rules and require entities causing interference to resolve that interference.

Finally, the Joint Commenters support the proposal by the Personal Communications Industry Association to combine the 800 MHz and 900 MHz Business and Industrial/Land Transportation Pools. There is little rationale for this continued separation, and lifting the 800 MHz freeze on inter-category sharing will help numerous Business Radio Pool licensees find additional spectrum to meet their communications needs.

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To: The Commission

COMMENTS

Aeronautical Radio, Inc. ("ARINC"), JPJ Electronic Communications, Inc. ("JPJ"), Sid Richardson Energy Services Co. ("Richardson"), Intel Corporation ("Intel"), New York Communications Company ("NYCOMCO"), United Airlines, Inc. ("United"), Northwest Airlines, Inc. ("Northwest"), North Sight Communications, Inc. ("North Sight"), KLL Wireless, Inc. ("KLL"), G & P Communications ("G & P"), SR Communications Associates ("SRCA"), CNY, Inc. ("CNY"), Communications and Industrial Electronic Corporation ("CIEC"), Wecom, Inc. ("Wecom"), Ragan Communications, Inc. ("Ragan"), William J. Young ("Young"), Ka-Comm, Inc. ("Ka-Comm"), WS Electronics, Inc. ("WS"), Western Communications, Inc. ("Western"), Commtronics Of Virginia, Inc. ("Commtronics"), Motient Communications, Inc. ("Motient"), Palomar Communications ("Palomar"), Smartlink Communications ("Smartlink"), Pete's Communications, Inc. ("Pete's"), Skyline Communications, Inc. ("Skyline") and Bell Interconnect,

Inc. ("Bell")(the "Joint Commenters") hereby respectfully submit their Comments in the above-captioned proceeding.[1]

I. BACKGROUND

Each of the Joint Commenters is a licensee or service provider in the 800 MHz band. The group represents a cross-section of private radio interests impacted in this proceeding. The Joint Commenters include internal user licensees (ARINC, Intel, Northwest, United and Richardson), SMR operators who have been relocated pursuant to the Commission's "Upper 200" SMR channel proceeding (JPJ, KLL, G & P, Ragan, Young, SRCA, CNY, Wecom, Skyline, WS, and NYCOMCO), Economic Area Licensees in the "Lower 80" SMR channels (Western, Ragan, SRCA, Motient and WS), EA Licensees in the Upper 200 SMR frequencies (North Sight), EA Licensees in the General Category SMR Channels (Motient, Western), and incumbent SMR operators and system managers throughout the band (Commtronics, Ragan, Motient, WS, Smartlink, CIEC, Pete's, Bell, Palomar, Wecom, Young, Western, IE, JPJ and NYCOMCO). The group includes both urban (ARINC, Intel, United, Northwest, Motient, Palomar, NYCOMCO, Smartlink, Bell) and rural (JPJ, Western, Richardson, etc.) operations. Thus, the Joint Commenters represent the entire panoply of non-public safety licensees who are impacted in this proceeding.

A. Public Safety Use Of SMR Systems

However, while the Joint Commenters are not themselves public safety entities, many SMR operators have public safety agencies (including both police and fire departments) as end users on their systems. For example, NYCOMCO's 800 MHz SMR System serves more than 4,000 mobile and portable units, 75% of which are public safety units. Similarly, Ragan's six-site SMR system

[1] 67 FR 16351 (April 5).

in Peoria, Illinois consists of 33 separate public safety eligible agencies and more than 1,000 public safety mobile units, almost 85% of the system's total mobile units. The system also serves the local power company, giving these agencies interoperability. In addition, the Ragan system serves as the county-wide Tornado Siren System and Mobile Data System. WS's SMR system serves 30 different public safety departments, accounting for more than 700 mobile and portable units, or more than 80% of the system's total mobiles. Similarly, JPJ's SMR System is more than 80% public safety end users. North Sight's customer base includes serving not only Puerto Rico area airport and cargo pier users, but also several Puerto Rico police and EMS operations. Skyline's operation is more than 28% public safety eligible entities.

There are other SMR operators nationwide with the same public safety utilization, and utility use on the same system. RACOM Corp. operates over 80 ESMR sites throughout Iowa, Nebraska, South Dakota, and parts of Minnesota, Wisconsin, Illinois. Racom serves approximately 10,000 users with over 60% being actual public safety agencies. Another 25% are utility operators, with the remaining users being transportation/industrial units.

All of the Racom sites are connected together with T1 circuits, providing wide area coverage and complete interoperability between all 10,000 users. The network is designed and built to exacting Public Safety standards and offers 8 levels of priority usage. Over 25 million transactions are handled each month with over 6 million of those being mobile data. Several public safety agencies who have their own licensed 800 MHz channels and site equipment are seamlessly interconnected into the RACOM Network. These agencies utilize their own channels, first and exclusively, and"roll-over" to RACOM's ESMR channels automatically as the instant critical need arises. RACOM acts like a Multi-State interoperable network that encompasses the whole range of

First-Responders in any emergency; including many Federal Agencies also brought together within this system. Thus, any action considered by the Commission must also consider the impact on these public safety users, which have an equal right to public safety system licensees to an interference-free operating environment.

B. Public Safety Services On Internal-Use Systems

Private, internal-use systems also have important, public safety aspects to their operations. For example, Richardson is a privately owned, mid-stream natural gas company, and operates an 800 MHz trunked system in New Mexico, and a 900 MHz trunked system in Texas. The system handles real-time monitoring of Richardson's 4,000 mile natural gas pipeline. The system provides voice communication and data polling. One of the key services provided by the system is early detection and isolation of pipeline ruptures. Since much of the gas is laden with the toxic gas hydrogen sulfide, the radio system performs an incredibly important public safety role.

Intel has 800 MHz radio systems at its plants in New Mexico and Oregon. At Intel's New Mexico facility, the site radio system is a life safety system. Intel has achieved 100% site coverage in the plant. Along with the Emergency Response team, site facilities, confined space, security, shuttle, automation, chemicals, materials and warehouse, many contractors are on the site radio system making fab construction and tool installation a safer and speedier process. Total talk time on the New Mexico system is between 14 and 15 hours a day distributed among a ten channel trunking system.

At Intel's Oregon facilities, the radios are used for: (1) medical and chemical emergency response; (2) fire system response; (3) facilities control response; (4) security response and patrol;

and (5) emergency operation center control and coordination (earthquakes, power outages, wind storm, etc.).

The ground radio systems utilized by ARINC, Northwest and United at the various airports serve as a vital link in ensuring not only the timely departure and arrival of aircraft, but also the safety of the public. The two-way radio systems are used to support a variety of airline personnel, from baggage handlers to security, from gate attendants to plane de-icing personnel. The large-scale rapid turnaround of aircraft at busy airports is an unusually complex and expensive industrial process. This process works only when supported by effective communications systems that provide a high degree of minute-by-minute coordination between and within the many specialty areas comprising an air carrier's work force.

Customized airport land mobile radio systems provide air carriers with the ability to exercise precise tactical control over the several thousand personnel necessary for the operation of a major air terminal. This control requires very intense and in-depth voice communication transactions that must be accomplished quickly and without delay. These operations also place a critical dependence on efficient ground processing operations which are themselves a highly-orchestrated tactical exercise comprising critical aircraft maintenance baggage/freight, fueling, catering, cabin servicing, and passenger unloading/loading activities which must take place in a narrow window (generally 50 minutes) for each aircraft.

Terminal security staff are responsible for the operation of passenger terminal security checkpoints, supervision of contract security forces, coordination of special passenger movements (e.g., VIPs, prisoner transport, plane-side motorcades), and liaison with airport police, US Customs, DEA, FBI, Secret Service, and postal authorities. These specialized personnel normally maintain

two-way radio contact with the station command center, customer service staff, and checkpoint security personnel. In some cases an air carrier's security staff also have two-way radio communication with airport police and other authorities. Additionally, federal authorities operating at the airport usually maintain an independent ability to monitor the two-way radio systems of the air carriers.

C. Motient And Its Network

The Motient Network was originally designed by Motorola as a private network for IBM. The network was to provide non-voice data-only service to IBM field service personnel in the United States, Puerto Rico and the Virgin Islands. Motorola later began implementation of a separate network to provide service to other users. In 1990, Motorola and IBM joined the networks, called the ARDIS network, to begin providing public wireless data service to users throughout the two networks' coverage areas.

The network was re-named Motient in 2000. The Motient network now spans over 430 cities including coverage in every MSA defined in the United States. The Motient network currently comprises about 2,300 base stations, with a growth of 100-300 stations per year. The network services about 240,000 subscriber devices and is projected to grow to over 1 million subscribers over the next few years.

Both the network designed for IBM and the Motorola Network utilized the same unique technology to provide this nationwide data service. The technology, known as single frequency reuse (SFR), allows an entire metropolitan area to be serviced by the same 25 KHz channel pair. Through the use of this technology, virtual channels are created by allowing multiple transmitters to be keyed on the same channel at the same time. This increases the channel capacity beyond the

simple available airtime of one (1) channel by using the same time slot to send different messages to different users within the service area. Thus, the technology achieves spectral efficiency by enhancing the capacity of every channel pair used in the network.

At the time of the original network implementations in the mid-1980's, the chosen protocol was Motorola's MDC-4800. Based on this 4800 bps over-the-air protocol and the projected IBM capacity requirements, it was determined that the system would require one 25 KHz channel pair in each city with the exception of New York and Los Angeles. Due to the large number of projected users in New York and Los Angeles, these areas would require two (2) 25 KHz channel pairs. IBM requested two (2) channel assignments for their use across the entire country, but due to treaty agreements and licensing restrictions in place at the time of the request, they were actually granted six (6) channel pairs in different areas. Basically, Ch 194 was assigned nationwide with the exception of the border areas on a non-interfering basis to existing licensees and Ch 161 was granted in the two large metropolitan areas. Ch 161 was also licensed in some other associated areas requested by IBM due to work-group relationships and the non-synthesized radios in use at the time. Additionally, Ch 571 was granted for use in sites along the Canadian border, Ch 227 (low offset) was granted for the Mexican border, Ch 149 was granted for Alaska and Ch 517 was granted for Buffalo, New York due to a unique Canadian interference issue. The following table shows the original six "core" channels and their area of operation:

Channel Number	**Motient Designator**	**Area of Operation**
Ch 194	F1	Nationwide in most areas, except Borders
Ch 161	F2	New York, Los Angeles, and other areas, except Borders

Ch 571	F3	Cities along Canadian Border
Ch 227	F4	Cities along Mexican Border
(low		
offset)		
Ch 517	F5	Buffalo NY
Ch 149	F6	Cities in Alaska

At the time that Motorola and IBM joined forces to form what was known as the ARDIS Network, the original six (6) IBM channel assignments were the basis of the network, called the six "core" channels. Three additional assignments that Motorola had obtained in the three major cities that Motorola had built-out were also integrated into the original 1990 network.

Shortly after the formation of the ARDIS Network, three new features were implemented which enhanced the available network service:

- The first was the introduction of frequency agile subscriber units. These would enable a user to communicate with the network with the same device no matter which of the network frequencies was operating in the areas.
- The second was an enhancement to the protocol to allow the subscriber unit to determine that a carrier on one of its programmed frequencies was being operated by the Motient network and not by another licensee. This allowed the user to roam throughout the network and obtain connection without interfering with other licensees by transmitting on a frequency not licensed to the network in that area. It also provided for a mechanism to provide the subscriber units knowledge of new frequencies in the area as they were implemented and a method for the network to move units from congested channels to capacity available channels.
- The last was Motorola's RDLAP 19.2 protocol. This higher speed, 19,200 bps, over-the-air protocol provided greater channel capacity within the same 25 KHz channel pair by use of both a higher data rate and the SFR virtual channel technology. This higher speed protocol was critical to be able to economically address the large growth of wireless data subscribers.

When these features were implemented it was determined that in order to limit the time required for a subscriber to connect to the network in a new area the programmed scan list would contain only the original six (6) "core" channels. This decision was based on the fact that scanning

the entire band for connection on the intermittently keyed network required by SFR would require extremely long connection times and subscriber dissatisfaction.

Since the modifications made to the network as part of the formation of the ARDIS Network, the Motient Network has continued to grow and add capacity by obtaining channel pairs where needed from the channels available in the area. The subscriber units have continued to function well in this environment where the new channels in an area are reported to units in that area by using open airtime on the one or more of the original six (6) channels to broadcast available channel information. Thus a unit from Alaska operating on Ch 149 can travel to the Houston area and, after connecting to Ch 194, receive information about the other three channels available in the area. The unit can then automatically switch to the channel running the highest speed protocol for the duration of his stay. Due to the high capacity of users on each channel and the SFR RF system design, Motient can add 1000's of additional users in a given coverage area using only one additional channel at a time. The Motient network uses the spectrum extremely efficiently and can continue to grow its user base one channel at a time.

From this description it can be seen that the Motient Network can fit into any area's available frequencies with no change to the subscriber units. However, this is dependent upon the requirement to maintain one or more of the original six channels in each coverage area as both a traffic carrying channel and a connectivity channel for subscribers in all areas served by the network.

As Motient is serving over 240,000 users, providing wireless data services across the entire United States, it would be impossible for Motient to leave the 800MHz band for either the 700 MHz or 900 MHz band. Every subscriber user and every base station would be required to be replaced with equipment that does not exist from any vendor at this time.

If all channels within the 800MHz band were re-allocated to other channels within the band, there would be a significant burden to Motient in cost, time to implement, and customer satisfaction. All subscriber units would have to be recalled and re-programmed to add into the "core" device channel list the new channel assignments. After the transition to the newly assigned channels took place, Motient would need to re-visit each Subscriber Unit to re-program the channel list a second time to remove the original channels. Although this extra step is not totally required, the time to acquire the Motient service while roaming to different coverage areas would be extended if the list was not reduced down to a smaller number of channels.

II. COMMENTS

A. Interference In The 800 MHz Band

There are primarily three types of interference presently experienced in the 800 MHz band: intermodulation interference; desense interference;[2] and Nextel Communications, Inc.[3] "oops" interference. It should be noted that it is not only public safety licensees that experience interference from Nextel. Non-public safety licensees have also experienced various types of interference from

[2]Desense is a generic term. There are really two types of desense interference: (1) blanketing interference, which is another term for receiver desensitization; and (2) broadband, or sideband noise, which hides the desired signal in the radio. Blanketing interference is "off channel" because there is a signal entering the front end of the radio not on the receiver frequency. Broadband, or sideband noise, is "on channel", because it enters the receiver on the receiver frequency. Desense is almost a silent interference, in that there is not a specific intelligible signal generated in the radio. Instead, the receiver characteristics of the radio are impacted, causing reduced signal reception, or none at all.

[3]"Nextel" will be used to refer to both Nextel Communications, Inc. and Nextel Partners.

Nextel.[4] However, in most cases the licensees have been able to resolve the problem directly with Nextel.[5]

In one particular case, the SMR licensee employed engineers at Comspace Corporation, and with the cooperation of Nextel engineers, conducted an extensive examination of interference experienced by the licensee. The report that was generated from that examination is attached hereto. What the report dramatically demonstrates is that, without interference abatement procedures in place, Nextel causes a significant amount of interference to other non-public safety operators in the band. Further, the report demonstrates that interference caused by Nextel not only occurs to analog systems, but also to digital systems. Thus, this proceeding is not concerned with digital vs. analog operation, but rather cellularized operation vs. non-cellularized.

While intermodulation and desense are well-known phenomenon, Nextel "oops" interference is relatively new. This type of interference has been experienced in the field where local Nextel engineering personnel are unaware of the regulatory environment in which Nextel operates. This interference most often happens at night, when Nextel begins operations on a channel not previously operated at the site. Ragan, for example, frequently receives telephone calls in the middle of the night from its public safety agency customers, complaining that Ragan's system has ceased

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[4]For example, three of the interference reports on the Project 39 portion of APCO's Web Site (http://www.apco911.org) have come from public safety end users on NYCOMCO's SMR System.

[5]It should be noted that Nextel's White Paper discusses interference from "CMRS" systems. However, there are numerous SMR Systems which are interconnected with the PSTN (including some of the Joint Commenters), which are therefore classified as CMRS, which do not employ cellularized architecture, and do not cause interference to public safety systems.

operating, when in fact it is Nextel's improper co-channel operation which has terminated the ability of Ragan's customers to access Ragan's system.

Often, where another operator complains that Nextel has begun operating on a channel for which it is not licensed, or for which the transmitting location is impermissibly close to co-channel operations, the local Nextel engineer will tell the complaining licensee that Nextel has a geographic license and can operate any channel anywhere in the area. Thus begins an educational process with each new engineer, occasionally with the result of the local licensee having to contact its telecommunications counsel and have counsel contact Nextel's corporate office.

For example, Nextel turned on a frequency at Urbana, Illinois, approximately 7-8 miles from a site where that channel is used by and licensed to Young. The local Nextel systems engineer denied that it was Nextel operating the channel. After considerable effort by Young demonstrating that it was indeed Nextel's operation, Nextel shut down the channel. In another incident, Nextel turned on a channel in St. Joseph, Illinois which Nextel had traded to Young in a relocation agreement. Once again, Nextel denied that they were causing the problem, and once again Young had to expend considerable resources to have the Nextel operation shut off.

Sometimes, the interference occurs because of improper licensing of Nextel's "build out" sites. For example, in San Diego, California, Nextel was improperly licensed for dozens of non-border 800 MHz frequencies in the area which impermissibly short-spaced Palomar's operation on "offset" frequencies.

The time and resources expended by non-Nextel incumbent operators to locate, research and resolve Nextel interference cannot be minimized. In many cases, operators experiencing interference are small businesses, and simply do not have the resources to be Nextel's interference

bird-dog. Whatever resources Nextel spends on interference resolution, that same amount of time and resource is spent by those experiencing interference from Nextel.

B. Desense And Intermodulation Interference

Desense and intermodulation interference are not recent occurrences in radio. However, several factors have contributed to greater recognition and problems associated with interference.

First, service expectations of land mobile radio users, particularly public safety users, have changed dramatically. Years ago, users had no expectation of reliable coverage from wide-area dispatch systems at every location, particularly inside of buildings and subways. Even before Nextel began operating, 800 MHz radio systems had coverage "holes." With cellular carriers able to provide service to customers in the garage of high-rise office buildings, for example, public safety users now have similar service expectations. And these users expect this level of service with increasingly smaller, lighter and more full-featured portable units with greater battery life, even though such coverage is often afforded by cellular systems through the use of bi-directional amplifiers. Unfortunately, limited budgets for system construction did not permit most public safety agencies to design and build systems with this level of service expectation. These public safety systems were designed (often years ago) for the best operating environment. However, the growth of cellularized[6] operations throughout the band has created a poor operating environment, one which public safety systems, and some non-public safety systems, have a difficult time navigating.

Tower owners and users have dealt with desense and intermodulation interference for years. A properly managed tower site has always had restrictions imposed by the owner or manager

[6]The term "cellularized" will be used throughout these comments to refer to systems which utilize low antenna, multiple-site, hand-off systems with numerous channels at each site.

requiring new operators to conduct IM studies to ensure that problems to other operators would not occur. Further, few users expect their own mobile units to operate in the immediate vicinity of the transmitters, because their radios were desensed by the overwhelming amount of RF in the transmitter building.

What has changed is that the need of cellularized operators to create additional capacity has caused these system operators to use more transmitters with antennas lower to the ground, and in areas traditionally not utilized for transmission facilities in the past.[7] Thus, the desense interference experienced on the former mountaintop site has "come down to the streets." Further, the sheer number of frequencies used by cellularized operations at any one site has increased many fold the number of potential IM "hits" which can now occur on the street, and at a combined power level heretofore never experienced. It is the experience of the Joint Commenters that 3rd Order IM from a cellularized system creates a problem "on the ground" of between one-quarter mile to two miles, with 5th Order IM causing a problem in a small area around the transmitter site from these low transmission points.

Another factor contributing to this interference is the trend away from cavity combiners by cellularized operators. By utilizing broadband hybrid combiners, cellularized operators are able to remotely turn frequencies on and off, giving them tremendous flexibility and cost saving in system design and implementation. Unfortunately, these combiners directly lead to greater interference for other users.

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[7]For example, short buildings, forty (40) foot towers along highways and streetlight poles.

The potential for IM interference is even greater for NPSPAC public safety licensees. These frequencies are an "island" between Nextel's cellularized operations, and those of Cellular A and Cellular B carriers. While non-public safety licensees on lower frequencies do experience interference, the Joint Commenters are not aware of lower 800 MHz interference attributed to Cellular A or Cellular B operations.[8]

On an individualized basis, there are a variety of potential "in the field" solutions when interference is experienced. For example, as shown on the attached interference report, merely shutting down a particular channel used by the carrier can result in a 3 to 8 dB reduction in the noise floor. A 1 to 2 dB reduction in power results in much greater savings in the noise floor, lowering it by 3 to 6 dB.[9] Increasing antenna heights to more than 80 feet also provides significant improvement. The utilization of mobile radios with IM specifications greater than 75 dB is effective in many situations in remedying the interference problems.

C. FCC Regulation Of Interference

[8]In its "White Paper", Nextel goes to great lengths to blame the current interleaving of channels in the 800 MHz band for interference. However, Nextel's own White Paper belies this assertion, in that the very same White Paper (at page 10) blames Cellular operators for contributing to the interference problem, and Nextel seeks reimbursement for public safety relocation from Cellular operators, which are not interleaved with public safety systems. In fact, the Joint Commenters own experience is that the mere interleaving is less of an issue as compared to the sheer frequency proximity of Nextel's operations. Moving Nextel to one side, and everyone else to the other, may help reduce the potential number of IM "hits", but does nothing to eliminate desense. Only a healthy frequency separation (with limited "front end" radios) can truly limit desense interference.

[9]The Joint Commenters understand that not all carriers reduce their power across the board when putting in a new transmitter site. Since the cellular radio seizes the strongest signal, such an ERP reduction is not always necessary for the carrier, and enables carriers not only to increase capacity but also to reach locations which might not be reachable with lower ERP.

The FCC has long recognized that interference can occur, even when all licensees are operating within their licensed parameters. Where such interference has been anticipated, the FCC has typically sought to create rules to limit such interference or ensure that the party causing the interference must cure the interference.[10] Typically, this has occurred with "blanketing interference", which is one form of desense interference.[11] Most recently, the Commission has been most concerned with blanketing interference from XM Radio's terrestrial operations.[12] In

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[10]See, for example, 47 C.F.R. §22.353; 47 C.F.R. §27.58; 47 C.F.R. §73.317. See also, Graeme Freeman, et. al. v. Burlington Broadcasters, Inc., d/b/a WIZN et. al., 204 F.3d 311 (2nd Cir. 2000); *Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service*, Memorandum Opinion and Order On Reconsideration of the Sixth Report and Order, MM Docket No. 87-268 (1998) at para. 184; FM Broadcast Station Blanketing Interference, 57 RR 2d 126 (1984); *Request For Declaratory Ruling on the Use of Digital Modulation by Multipoint Distribution Service and Instructional Television Fixed Service Stations*, Declaratory Ruling and Order, 11 FCC Rcd 18839 (1996) at para. 25; *Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service*, Memorandum Opinion and Order, 12 FCC Rcd 3977 (1997) at para. 15; *Terrestrial Systems in the Ku-Band Frequency Range*, First Report and Order and Further Notice of Proposed Rule Making, 16 FCC Rcd 4096 (2000) at para. 274; *Amendment of Parts 1, 21, 23, 73, 74, 81, 87, 87, 91, 93, 85 and 97 of the Commission's Rules to Require Prior Coordination with the U.S. Department Of Agriculture and the Department Of The Interior When Desiring To Install Or Modify Transmitting Facilities On Certain Lands Under The Jurisdiction Of Those Departments*, Report and Order, Docket No. 16591, 6 FCC 2d 577 (1967); *Height and Power Increases in the Public Land Mobile Radio Service*, Notice of Proposed Rule Making, CC Docket No. 88-135, 1 FCC Rcd 1710 (1988) at para. 30; *Height and Power Increases in the Public Land Mobile Radio Service*, Report and Order, CC Docket No. 88-135, 4 FCC Rcd 5303 (1989) at para. 30; *Height and Power Increases in the Public Land Mobile Radio Service*, Order On Reconsideration, CC Docket No. 88-135, 5 FCC Rcd 4604 (1990) at para. 34-36.

[11]"Blanketing interference occurs when a receiver is near a relatively high-powered transmitter and the high power overloads the components of the receiver and prevents reception of the desired signal by the receiver. XM Radio, Inc., 24 CR 845 (IB 2001). See also, *Creation of Low Power Radio Service*, Report and Order, MM Docket No. 99-25, 19 CR 597 (2000) at footnote172.

[12]XM Radio, Inc., supra.

broadcasting, IM interference is called Receiver Induced Third Order Intermodulation Effect ("RITOIE").[13]

The Commission was extremely concerned with out-of-band interference with 900 MHz PCS systems, which fundamentally operate in the same manner as Nextel's system.[14] In another proceeding, the Commission considered the possibility of adjacent channel interference in allocating the 900 MHz band for Part 90 systems, and elected to assign multiple channels in contiguous blocks.[15]

The Commission received very explicit warnings from the land mobile industry that interference to other Part 90 licensees could occur from cellularized operations in the band.[16] Unfortunately, the FCC elected not to create specific rules to either prevent such interference, or regulate it, beyond what has traditionally been rules utilized by the Commission for adjudicating interference disputes. However, the Commission did acknowledge the need to preserve for licensees the protection from interference guaranteed by the Commission's Rules.[17]

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[13]WKLX, Inc., 6 FCC Rcd 225 (1991) at footnote 2.

[14]*Amendment of the Commission's Rules to Establish New Personal Communications Services*, Notice Of Proposed Rule Making and Tentative Decision, Gen. Docket No. 90-314 (1992) at para. 127-129. See also, *Amendment of Parts 1, 21, 22, 74 and 94 of the Commission's Rules to Establish Service and Technical Rules for Government and non-Government Fixed Service Usage of the Frequency Bands 923-935 MHz and 941-944 MHz*, Memorandum Opinion and Order, Gen. Docket No. 92-243 (1990) at para. 7.

[15]*Amendment of Parts 2 and 22 of the Commission's Rules Relative to Cellular Communications Systems*, Report and Order, 2 FCC Rcd 1825 (1986) at para. 71.

[16]*Amendment of Part 90 of the Commission's Rules to Permit the Short-Spacing of Specialized Mobile Radio Systems Upon Concurrence from Co-Channel Licensees*, Report and Order, PR Docket No. 90-34, 6 FCC Rcd 4929 (1991) at para. 16; Fleet Call, Inc., 6 FCC Rcd 1533 (1991) at footnote 35.

[17]Fleet Call, Inc., supra at para. 13.

Pursuant to Section 90.173 of the Commission's Rules, licensees are required to cooperate in the use of Part 90 spectrum. However, where licensees are unable to resolve interference disputes amongst themselves, the Commission expects that the licensees will bring their problem to the Commission for resolution.[18] Historically, in the absence of a specific rule, the FCC has relied on the so-called "last in, fix it" rule of thumb to resolve interference disputes. This doctrine, first annunciated in Midnight Sun Broadcasting Co.,[19] has been the touchstone of Commission policy. This policy includes Part 90 stations.[20] Under this criteria, it is patently clear that the Commission may require Nextel (and Cellular A and Cellular B carriers) to remedy the interference.

Directly on point is the Commission's experience with TV Broadcast Channel 69 causing interference to 800 MHz land mobile stations in Atlanta, Georgia. WVEU-TV's signal was desensing adjacent channel mobile receivers. In that proceeding, the Commission clearly and unequivocally held WVEU responsible for resolving the interference, including paying for the relocation of the impacted land mobile licensees.

> Although the land mobile radio licensees are expected to cooperate with WVEU by offering suggestions to resolve the problem and by implementing a solution to it

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[18] Jack Straw Memorial Foundation, 35 FCC 2d 397, recon. denied, 37 FCC 2d 544 (1972) at para. 7.

[19] Midnight Sun Broadcasting Co. v. FCC, 11 FCC 1119 (1997); See also, Sudbrink Broadcasting of Georgia, Inc. v. FCC, 65 FCC 2d 691 (1977); Jesse Willard Shirley, 24 RR 2d 982 (1972); Jack Straw Memorial Foundation, 35 FCC 2d 397, recon. denied, 37 FCC 2d 544 (1972); Windmill Broadcasting Co., 44 RR 2d 475 (1978).

[20] *Amendment of Sections 22.501(g)(2) and 84.65(a)(1) of the Rules and Regulations to Re-Channel the 900 MHz Multiple Address Frequencies*, Report and Order, PR Docket No. 87-5, 3 FCC Rcd 1564 (1988) at para. 60; *Amendment of Parts 2, 22, and 90 of the Commission's Rules to Allocate Spectrum in the 928-941 MHz Band and to Establish Other Rules, Policies, and Procedures for One-Way Paging Stations in the Domestic Public Land Mobile Service and the Private Land Mobile Radio Services*, Second Report and Order, Gen. Docket No. 80-183, 91 FCC 2d 1214 (1982) at para. 32.

> reasonable in both cost and configuration – so as to preserve their service as well as that of WVEU, there is no doubt that the financial responsibility for eliminating objectionable interference falls upon the "newcomer."[21]

Further, it is irrelevant whether Nextel anticipated that its system would cause such interference, or that the costs of resolving interference caused to incumbents could be tremendous.

> ... [R]egardless of whether it was aware of the possible interference, the fact remains that, at its proposed power, WVEU would cause objectionable interference to several land mobile radio repeaters. We recognize that whatever measures WVEU may try could well cost the station greatly in excess of that which it anticipated. This, however, cannot influence our perception of the public interest.[22]

The Commission also has the authority to require modification of the licenses involved, pursuant to Section 316(a) of the Communications Act of 1934.[23] It should be noted that it has been Nextel's past position that interference to an incumbent from a licensed facility operating within its authorized parameters is a de facto modification of the incumbent's license, and therefore the incumbent may request a hearing pursuant to Sections 309 and 316 of the Communications Act.[24] "Disruption of service created as the result of the transmission of undesired signals, where not dependent upon receiver characteristics, may create a Section 316 right if uncorrected."[25] While the

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[21]Broadcast Corporation of Georgia (WVEU(TV)) Atlanta, Georgia, 92 FCC 2d 910 (1982) at para. 7, recon. denied, 96 FCC 2d 901 (1984).

[22]Id.

[23]47 U.S.C. §316 (a)(1); See also, B & W Truck Service, 15 FCC 2d 769 (1968); Clayton County, Georgia, 16 FCC Rcd 14880 (PSPWD 2001); Association Of Public Safety Communications Officials International, Inc., 16 FCC Rcd 14926 (PSPWD 2001).

[24]*Request for Waivers of Part 90 of the Commission's Rules by the County of San Bernardino to Operate a County-Wide Public Safety Communication System in the 800 MHz Band*, Memorandum Opinion and Order, 3 FCC Rcd 6033 (1988) at para. 11.

[25]WKLX, Inc., 6 FCC Rcd 225 (1991) at para. 10; See, e.g., Western Broadcasting Co. v. FCC, 674 F.2d 44 (D.C. Cir. 1982); FCC v. National Broadcasting Company (KOA), 319 U.S. 239 (1943).

Joint Commenters do not at this time request a hearing, the Joint Commenters reserve the right to make such a request should the Commission's action (if any) in this proceeding result in modifications such as those proposed by Nextel in its White Paper.

Even when the "transmitted signals fully comply with all of our emission standards and requirements but nonetheless, because of the particular characteristics of certain receivers, result in service disruption within those receivers and not others," the Commission may find it in the public interest to require resolution of individual complaints.[26] In addition, the mere inability to pay for any necessary remedies is insufficient to overcome the mandate.[27] "Whether by imposition of specific conditions or by operation of law, a licensee building a new facility is obligated to take all necessary steps, including financial burden, to correct interference problems caused by new or modified construction.[28]

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[26]WKLX, Inc., 6 FCC Rcd 225 (1991) at para. 10. See also, Graeme Freeman, supra.

[27]Calvary Educational Broadcasting Network, Inc., 9 FCC Rcd 6412 (1994) at para. 5. See also, Broadcast Corporation of Georgia (WVEU(TV)) Atlanta, Georgia, 92 FCC 2d 910 (1982), recon. denied, 96 FCC 2d 901 (1984).

[28]*Common Carrier Public Mobile Services Information Republication Of Standard Broadcast Reradiation and Tower Construction Authorized Under Part 22 Of The Rules*, Public Notice, 66 RR 2d 1777, released November 14, 1989. See also, *Request for Waivers of Part 90 of the Commission's Rules by the County of San Bernardino to Operate a County-Wide Public Safety Communication System in the 800 MHz Band*, Memorandum Opinion and Order, 3 FCC Rcd 6033 (1988) at para. 15; See also, *Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service*, Memorandum Opinion and Order, 12 FCC Rcd 3977 (1997) at para. 15; Sudbrink Broadcasting of Georgia, Inc., 65 FCC 2d 691 (1977) at para. 5. B & W Truck Service, 15 FCC 2d 769 (1968); Athens Broadcasting Company, Inc., 68 FCC 2d 920 (1978) at para. 4.

In the past, the Commission has specifically conditioned licenses which it deemed were potentially capable of causing desense and IM interference to adjacent land mobile systems.[29] The Commission has every reason to do the same in this proceeding.

Nextel professes to be a good spectrum citizen by stating on page 10 of the White Paper that it has "voluntarily" undertaken measures to remedy interference to public safety users. However, such efforts are not voluntary at all. Rather, Nextel is required by Commission rule and policy to undertake such efforts to remedy interference which it is causing.[30] Nextel has the burden of constructing its system in a manner that will not cause objectionable interference to other licensees.[31] It is interesting to note that only one year ago Nextel represented to the Commission in another proceeding that its digital technology gives it "... additional flexibility to mitigate and/or prevent interference with certain adjacent channel 800 MHz public safety communications systems."[32] Yet, it is now that same technology which Nextel tells the Commission is not compatible with the same public safety communications systems.

It is clear that the Commission has the authority to mandate the elimination of interference being caused by Nextel. Nextel has failed to demonstrate in its White Paper why it should be treated differently than WVEU-TV or other licensees causing interference despite their operation within the

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[29] Jack Straw Memorial Foundation, 35 FCC 2d 397, recon. denied, 37 FCC 2d 544 (1972).

[30]Section 90.403(e) requires licensees to "take reasonable precautions to avoid causing interference." See also, Cordell Engineering, Inc., 14 FCC Rcd 7440 (ECID 1999); Jesse Willard Shirley, 24 RR 2d 982 (1972); Shawnee Broadcasting Co., 45 RR 2d 436 (1979).

[31] Jack Straw Memorial Foundation, 35 FCC 2d 397, recon. denied, 37 FCC 2d 544 (1972) at para. 7.

[32]FCI 900, Inc., 16 FCC Rcd 11072 (WTB 2001).

bounds of their authorization. Certainly, it is paramount that the Commission, at a minimum, mandate that the bedrock principle of Midnight Sun continues to apply to this situation, even if the FCC makes fundamental changes in its allocation scheme in the 800 MHz band. This includes the 900 MHz band, where Nextel's "cellularization" of the band may cause similar interference in the future.

D. The Joint Commenters' Cooperation In Resolving Interference

The Joint Commenters are well aware of their obligations under Section 90.173 of the Commission's Rules to cooperate in the use of scarce radio spectrum.[33] In that light, the Joint Commenters, through counsel, have been actively participating in industry discussions and meetings which seek to develop regulatory solutions to the interference problem. The Joint Commenters have solicited input from every aspect of this industry impacted in this proceeding, including Nextel, public safety representatives, cellular and PCS licensees, independent engineers, SMR and private systems operators and manufacturers. Further, the Joint Commenters, through counsel, have participated in the APCO "Project 39" committee, which seeks technical resolution to this issue.

Through all of this work, discussion and experience, the Joint Commenters have determined that no systemic changes in the allocation in the 800 MHz band will totally resolve the interference problem. Each plan of which the Joint Commenters are aware has its own set of issues which make the proposal difficult to support.

As already discussed herein, the Joint Commenters oppose the Nextel White Paper solution for a variety of reasons. For example, Motorola has informed the Joint Commenters that Nextel's

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[33] See, for example, Jack Straw Memorial Foundation, 35 FCC 2d 397, recon. denied, 37 FCC 2d 544 (1972) at para. 7; Broadcast Corporation of Georgia (WVEU(TV)) Atlanta, Georgia, 92 FCC 2d 910 (1982), recon. denied, 96 FCC 2d 901 (1984).

proposal would impose a cost of $1.5 billion on private, non-public safety operators at 800 MHz. While the Commission may rightly be concerned with the cost of relocating public safety under Nextel's proposal (estimated at $1 billion by Motorola), the exact same issues are raised by imposing such costs on non-public safety licensees. Imposition of these costs will bankrupt many companies, make others unable to compete in the marketplace, and those companies not bankrupted by this imposition must pass this cost onto the public.

Motorola's costs estimates, while helpful, were based upon a variety of generalizations about the band. The Joint Commenters would like to make those generalizations more specific, and show that generalizations in this case underestimates the true costs. Under Nextel's plan, each of the Joint Commenters would need to purchase completely new equipment, regardless of whether the 900 MHz band is re-channelized. The cost to Motient, if equipment was available, would be $990 million! For Northwest Airlines (which only uses 800 MHz channels at a few airports), the cost would be over $5 million. United Airlines, which only uses 800 MHz spectrum at the Denver Airport, would be faced with a cost of $1.5 million. Intel's new 900 MHz facilities in New Mexico and Oregon would cost over $4 million.

For a small business such as SRCA, the cost would be $2.2 million, or about three years worth of gross income for SRCA. If SRCA had to pay for its own relocation, SRCA would be out of business. KLL, another small business, would have similar costs of $2.7 million, while Palomar would need to expend $2 million. Western, which provides service over a vast rural area, would incur a cost of approximately $10 million to move to 900 MHz.

Another "cost" of relocating for SMR operators, which cannot be easily quantified, is the impact on an operator's customer base. Having been through a relocation once already, SRCA,

Skyline, WS, Ragan, Wecom and others are well aware of the toll which relocation takes on the customer base of an SMR system. From a strictly logistical standpoint, accessing customers over what can be a more than 100 mile area is extremely difficult, particularly in light of the fact that all mobiles of a single customer must be retuned at the same time. The impact of asking a business with significant mobile usage to simply do without their communications system for a while is not conducive to retaining a customer. Then, in the middle of this transition, Nextel salespeople call and write to customers of the SMR system, telling the customer that the SMR operator is going out of business. As a result, many SMR operators have experienced a customer attrition rate of twenty to thirty percent.

Many of the Joint Commenters are "Lower 80" SMR licensees. These licensees, given incentive by the Commission to move to these frequencies with a promise of additional co-channel interference protection, were promised by the Commission that they would not have to move again.[34]

> .... any incumbent that is relocated from frequencies within the upper 10 MHz block, either voluntarily or involuntarily, will not be required to relocate again if we adopt our geographic area licensing proposal for the lower 80 and General Category channels.... We believe that these measures are necessary to protect the operational interests of incumbent licensees who relocate off the upper 10 MHz block. We also believe that these protections are essential for such incumbents to be able to engage in effective business planning.[35]

Further, the Commission's efforts to eliminate interference to public safety licensees must be re-crafted to resolve interference to public safety users. As discussed earlier, there are literally

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[34] *Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band*, Second Report and Order, 12 FCC Rcd 19079 (1997) at para. 52.

[35] *Amendment of Part 90 of the Commission's Rules to Facilitate Future Development of SMR Systems in the 800 MHz Frequency Band*, First Report and Order, 11 RCC Rcd 1463 (1995) at para. 74.

thousands of public safety mobile units which are end users on SMR systems and utility cooperatives.[36] Thus, the Commission's resolution in this proceeding must be universal for public safety, not merely considering one set of users and excluding another.

The Joint Commenters wish to make abundantly clear that while they are willing to be cooperative in reaching a solution, any regulatory solution must have four guiding principles: (1) licensees causing interference must be financially responsible for the costs of any frequency or

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[36]The public safety users discussed herein include traditional public safety "guns and hoses," not merely other public safety-related users. For example, operating on NYCOMCO's system are: City of Beacon Public Safety - Police, Fire and Education - (160 units); Town of Blooming Grove Police Department - (15 units); Village of Chester Police Department - (9 units); Cornwall/Highland Mills Public Safety including Village and Town Police Departments, Dept of Public Works, Building Zoning, etc - (122 units); Town of Crawford Police Department and Public Works - (28 units); Dutchess County Public safety including Sheriff, Transportation, Drug Task Force (encrypted), Dept of Public Works - (145 units); FBI Special Anti-Terrorist Unit (encrypted) - (2 units); Town of Fishkill Public Safety - Police, Highway, Parks, Zoning, Buildings - (121 units); Goodwill Fire Department - (20 units); Harriman Police Department - (8 units); Highland Fire Department - (4 units); Hyde Park Public Safety including Police, Highway, Parks, Education - (105 units); City of Kingston Public Safety including Police and Fire - (85 units); Town of Lloyd Police Department - (20 units); Town of Marlboro Police Dept - (20 units)
Maybrook Police Dept - (12 units); Middlehope Fire Dept - (20 units); Montgomery Public Safety including Police, Highway, Transportation - (58 units); Mt Hope Police Department - (13 units); New Paltz Public Safety including Town Police - (132 units); Town of New Windsor Police - (51 units); New York State Police - (115 units); New York State Police Special Drug Task Force - (19 units); City of Newburgh Police Department - (144 units); Town of Newburgh Public Safety including Police, Highway, Building, Transportation, Fire - (201 units); New York State Division of Parole - (16 units); Orange County Public Safety including 911, Sheriff, Highway, Fire - (307 units); City of Poughkeepsie Public Safety including Police, Transportation, Fire, Dept of Public Works, Parks, Sanitation - (264 units); Town of Poughkeepsie Public Safety including Police, Highway, Code Enforcement, Building, Zoning, Parks Water, Sewer - (230 units); Rhinebeck Public Safety - Village and Town Dept of Public Works - (35 units); Ulster County Public Safety Including 911, Sheriff, Transportation, Sanitation, Probation, Court Security - (168 units); Town of Ulster Police Department - (40 units)
Village of Walden Police Department -- (4 units); Town of Wappingers Public Safety including Highway, Building, Zoning, Code Enforcement - (39 units); Town of Woodbury Police Department - (58 units).

equipment changes;[37] (2) any solution must actually result in interference improvement for all licensees, not just public safety licensees; (3) non-public safety, non-cellularized licensees must not be "orphaned," in that they must be able to upgrade their own technology utilization, provided they do not cause interference to others; and (4) the FCC must not create a regulatory environment which will permit the same result again (including at 900 MHz), albeit with different licensees.

The "solution" proposed by Nextel in its "White Paper" accomplishes none of these goals, and must therefore be rejected. The Commission should not even consider having licensees who are not causing interference move to another frequency band at their own expense (which requires new equipment). In the single relocation case cited by the Commission, the relocation of non-common carrier microwave stations which relay television to CATV systems, the Commission was creating a new radio service, namely a community antenna relay ("CAR") service.[38] No new radio service is being created in the 800 MHz proceeding. Further, there was "no present congestion" in the CATV band, and the licensees that were moving (to an adjacent band) would actually be the ultimate beneficiaries of the new service. These issues are not present in the 800 MHz proceeding, where Nextel has proposed relocation by other licensees, at the licensees' cost, to directly benefit Nextel because of interference being caused by Nextel.

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[37]While Nextel may complain that the cost to Nextel of relocating users in the band exceeds what could be considered to be economically possible for Nextel, it is Nextel that is primarily causing interference, and no reason can be advanced that could permit Nextel to avoid that financial responsibility. Thus, Nextel must "pick its poison", remedy interference on a case-by-case basis, or pay for movement of many licensees in a re-banding.

[38]*Amendment of the Commission's Rules Relative to the Licensing of Microwave Radio Stations Used to Relay Television Systems*, First Report and Order and Further Notice of Proposed Rule Making, 1 FCC 2d 897, Docket No. 15586 (1965).

As the myriad of cases cited in the pleading demonstrate, the Commission has never required a party receiving interference (but not causing interference), to move to other spectrum and purchase new equipment, at its own cost. The Commission has always required that the party causing interference resolve the interference, at their own expense.[39] The Commission must reject any notion that incumbent payment of resolving Nextel's interference problem is in any way an acceptable resolution to anyone, other than Nextel. Implementation of such a solution can only have the gravest of consequences. The amount of time which would be lost in appeals alone makes this unacceptable, as public safety entities will be caught in a lengthy regulatory proceeding without being able to achieve the relief which they need in a timely manner.

The Joint Commenters wish to make clear that they are opposed to moving to 900 MHz, even with compensation for new equipment and for costs for implementation. It is the experience of the Joint Commenters that 900 MHz does not have similar propagation characteristics (resulting in a smaller service area) and reduced voice quality (from the use of 12.5 kHz channel bandwidth

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[39]Midnight Sun Broadcasting Co. v. FCC, 11 FCC 1119 (1997); Sudbrink Broadcasting of Georgia, Inc. v. FCC, 65 FCC 2d 691 (1977); Broadcast Corporation of Georgia (WVEU(TV)) Atlanta, Georgia, 92 FCC 2d 910 (1982), recon. denied, 96 FCC 2d 901 (1984); *Amendment of Sections 22.501(g)(2) and 84.65(a)(1) of the Rules and Regulations to Re-Channel the 900 MHz Multiple Address Frequencies*, Report and Order, PR Docket No. 87-5, 3 FCC Rcd 1564 (1988) at para. 60; Jesse Willard Shirley, 24 RR 2d 982 (1972); Jack Straw Memorial Foundation, 35 FCC 2d 397, recon. denied, 37 FCC 2d 544 (1972); Calvary Educational Broadcasting Network, Inc., 9 FCC Rcd 6412 (1994) at para. 5; *Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service*, Memorandum Opinion and Order, 12 FCC Rcd 3977 (1997) at para. 15; *Common Carrier Public Mobile Services Information Republication Of Standard Broadcast Reradiation and Tower Construction Authorized Under Part 22 Of The Rules*, Public Notice, 66 RR 2d 1777, released November 14, 1989; *Request for Waivers of Part 90 of the Commission's Rules by the County of San Bernardino to Operate a County-Wide Public Safety Communication System in the 800 MHz Band*, Memorandum Opinion and Order, 3 FCC Rcd 6033 (1988) at para. 15; B & W Truck Service, 15 FCC 2d 769 (1968); Athens Broadcasting Company, Inc., 68 FCC 2d 920 (1978) at para. 4.

equipment). For example, Palomar attempted to utilize 900 MHz equipment in San Diego. Unfortunately, the 12.5 kHz equipment (and resulting 2.5 kHz deviation), together with the mountainous terrain, resulted in a "chop" noise in the radio as loud as the desired voice, making the system unusable. Re-channeling the 900 MHz band, which would improve the voice quality problem, is not a long-term solution, as no equipment is available for such operation.

In addition, in the case of public safety end users on the NYCOMCO, Ragan and WS systems, these users utilize channels licensed to NYCOMCO, Ragan or WS, as well as channels licensed directly to the public safety entity. Moving NYCOMCO, Ragan and WS to 900 MHz, while keeping the public safety systems in 800 MHz, effectively puts these entities out of business.[40]

E. Resolving Interference In The Band

The Joint Commenters recognize that the Commission may find that addressing interference on a case-by-case, site-by-site basis overwhelming for Commission resources. Thus, the Commission is properly proceeding through rule making to access whether it should address the problem through rule changes, just as the Commission did in the TV-to-land mobile interference situation.[41] If the Commission is determined to create a regulatory solution beyond Nextel's clear responsibility under current rules to resolve interference which Nextel is causing, and the

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[40]Nextel's "suggestion" that licensees not desiring to move to 900 MHz may remain at 800 MHz on a secondary basis is totally unacceptable. No business can operate or make business plans with the knowledge that, as a secondary user, their authorization may be revoked at a moment's notice. Imagine the impact of ARINC having to shut down operations at Chicago's O'Hare Airport, because a local public safety agency moved onto the channel and experienced interference from ARINC's operation.

[41]*Resolution of Interference between UHF Channels 14 and 69 and Adjacent-Channel Land Mobile Operations*, Notice of Proposed Rule Making/Notice of Inquiry, 2 FCC Rcd 7328 (1987).

Commission elects not to move any licensees out of the 800 MHz band, the Joint Commenters support the modified NAM/MRFAC proposal submitted by the Private Wireless Coalition ("PWC"). The Joint Commenters believe that this plan reasonably balances the needs of each segment of the industry, if adopted as proposed.

The Joint Commenters have spent a considerable amount of time discussing interference issues in the band with a variety of engineers working on the problem. The Joint Commenters are convinced that the 4 MHz division between public safety and cellularized systems as proposed in the PWC 800 MHz plan is adequate to limit interference.[42] In the interference field test report attached hereto, it was found that there was a decrease in the noise floor of 6-7 dB when Nextel frequencies were at least 2 MHz away. Thus, a 4 MHz separation should significantly improve public safety communications. The Commission should also consider the restriction of broadband hybrid combiners in the band. Further, the Commission should consider limiting "power on the ground" by cellularized systems, which would significantly reduce the opportunities for desense interference to occur, pursuant to Section 90.205 of the Commission's Rules.

However, the Commission must recognize that this re-banding will not result in 100% interference-free operation. It will not be until manufacturers have developed a more "front end" limited radio, and public safety users have implemented new systems, that interference reduction can truly take hold. Even then, there is still potential IM interference to public safety and non-public safety users, although re-banding should lessen the incidences. The Commission must therefore

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[42]For example, Motorola's "Interference Technical Appendix, Issue 1.41 (February 2002)" at pages 45-48 recommends such "sub-banding" in several instances, although the Appendix does not make a specific separation recommendation with regard to appropriate frequency spacing.

make abundantly clear that carriers are responsible for resolving this interference, even after re-banding. Careful coordination of frequency use, such as that at the recent Winter Olympics, can reduce the potential instances of 3rd and 5th Order IM products. Thus, in addition to re-banding (and limitation on cellularized systems as defined in the PWC 800 MHz proposal), the Commission should also make the following rule changes: (1) mandate IM ratings on mobile radios of greater than 75 dB for the band; (2) restrict the use of broadband hybrid combiners; (3) limit "power on the ground" in the band;[43] and (4) require cellularized licensees to inform nearby Part 90 licensees which may be impacted by 3rd and 5th Order IM products (which can be predicted prior to operation) of new operations.[44]

F. The Instant Proceeding Is About Resolving Interference

It is the position of the Joint Commenters that the Commission must utilize this proceeding for one purpose, and one purpose only - resolution of interference. The Commission must ignore the other agendas which some parties may seek to inject into this proceeding, such as: (1) assigning additional spectrum to public safety; (2) creating public safety "interoperability"; (3) the acquisition of clear, contiguous spectrum by Nextel, or the prevention of that goal by other carriers; and (4) trading one potential band for so-called "3G" services for another band. To the extent that any of

[43]Section 90.205 of the Commission's Rules precludes a licensee from using more power than actually necessary for satisfactory operation of its station. However, some licensees utilize downtilt antennas to accomplish the same goal as maintaining high ERP levels. Thus, merely limiting ERP would be ineffective.

[44]The Commission's authority to impose such conditions has been utilized with regard to cellularized operations causing interference to AM Broadcast Stations. *Common Carrier Public Mobile Services Information Republication Of Standard Broadcast Reradiation and Tower Construction Authorized Under Part 22 Of The Rules*, Public Notice, 66 RR 2d 1777, released November 14, 1989.

these agendas are accomplished as a natural outgrowth of resolving interference within the 800 MHz band, the Joint Commenters have no objection. However, achieving these goals "on the backs of" the Joint Commenters by failing to achieve the Joint Commenters' four principles is intolerable. The Commission must keep focused on what can be the only goal in this proceeding, and must set aside pressure from various sectors to inject other agendas.

In addition, this proceeding is not about non-Nextel 800 MHz equipment or infrastructure being antiquated. The land mobile industry has seen an explosive growth in the use of new technologies at 800 MHz. Many SMR operators, utilities and public safety licensees utilize M/A Com's "EDACS" architecture, a state-of-the art system which permits the delivery of specialized services for these operations far and above that offered by Nextel. Similarly, licensees such as ARINC are implementing iDEN architecture identical to Nextel, but implementing the system in a manner to provide higher quality and additional services not offered by Nextel, without causing interference to other users. Motient operates a highly spectrum-efficient network. These architectures, as well as more traditionally operated equipment in the band, have only been recently purchased, and are nowhere near the end of its life cycle. For this reason, mandatory narrowbanding at 800 MHz would not be valuable. iDEN, for example, requires 25 kHz bandwidth channels.

Finally, the proceeding is not about homogenizing the 800 MHz band into an "all carrier" environment. Carriers can solve the communications needs of many users. For example Racom's operation represents the "holy grail" for public safety users of interoperability on a system which has the same level of coverage, service offerings and reliability as each of the public safety users would expect from their own system <u>together with utility users on the same interoperable system</u>, without the imposition of the tremendous costs associated with such implementation on each public

safety agency. However, one size does not fit all,[45] and the SMR operators which are part of these Joint Comments recognize the ongoing need for private system licensing.

G. 800 MHz and 900 MHz Pool Consolidation

The Commission has also requested comments on a proposal by the Personal Communications Industry Association, Inc. ("PCIA") to consolidate the 800 MHz and 900 MHz Business and Industrial/Land Transportation frequencies.

The Joint Commenters support the proposed consolidation. There exists little reason for the continued separation. For the most part, these channels are assigned on an exclusive basis, with separations between co-channel licensees being determined by specific rules. Therefore, there is no need to distinguish one type of user from another. Since these channels are generally not shared, unlike the "refarming channels", there is no need to distinguish between types of users.

The current freeze on sharing at 800 MHz between business and industrial eligibles has led to severe spectrum allocation abnormalities. This is because, while Industrial/Land Transportation entities are eligible in both the Industrial/Land Transportation and Business Pools, Business Pool eligibles are not. This "one way sharing" has led to extremely limited spectrum opportunities for Business Pool eligibles with legitimate communications needs. For example, of the fifty (50) Business Pool channels available at 800 MHz, Entergy Services, Inc. (an Industrial eligible) is licensed for forty-four (44) of the fifty (50) channels within seventy (70) miles of the Memphis

[45]For example, ARINC's system features a redundant and avoidant infrastructure, secure closed user group extranet data access to and from corporate operations from and to employees, and guaranteed quality of service 24 hours a day, seven days a week. These features cannot be found on a consumer system.

airport. As a result, all Business Pool eligibles in Memphis are limited to the remote possibility of finding an allocable frequency on the remaining six (6) frequencies.

III. CONCLUSION

WHEREFORE, the premises considered, it is respectfully requested that the Commission act in accordance with the views expressed herein.

Respectfully submitted,

PALOMAR COMMUNICATIONS
RAGAN COMMUNICATIONS, INC.
BELL INTERCONNECT, INC.
SKYLINE COMMUNICATIONS, INC.
MOTIENT COMMUNICATIONS, INC.
COMMTRONICS OF VIRGINIA, INC.
WESTERN COMMUNICATIONS, INC.
WS ELECTRONICS, INC.
G & P COMMUNICATIONS
KLL WIRELESS, INC.
CNY, INC.
WILLIAM J. YOUNG
PETE'S COMMUNICATIONS, INC.

AERONAUTICAL RADIO, INC.
UNITED AIRLINES, INC.
NORTHWEST AIRLINES, INC.
NORTH SIGHT COMMUNICATIONS, INC.
JPJ ELECTRONIC COMMUNICATIONS, INC.
SID RICHARDSON ENERGY SERVICES CO.
INTEL CORPORATION
NEW YORK COMMUNICATIONS COMPANY
SR COMMUNICATIONS ASSOCIATES
COMMUNICATIONS AND INDUSTRIAL ELECTRONIC CORPORATION
WECOM, INC.

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Date: May 6, 2002

Field Testing Report

14 July 2001

Evaluation of Potential Interference of FM and DCMA Signals by NEXTEL Channels for Two Locations in Dallas, TX

590 – 00000 - 0001

Revision History

Document Summary

File Location	ComSpace Corp. Server
File Type	Microsoft Word 97 SR-1 for Windows NT

Revision	Date	Implemented by	Change Description
Rev A	7/17/01	Joel N. Holyoak	Initial Release

Document Approvals

Name	Signature	Date
Randall West		
Robert McCarty		
Joel Holyoak		
Dan Ambler		

Field Testing Report – 14 July 2001

Summary:

Staff in Attendance:

Keller Communications:

Keller McCrary, President Keller Communications

NEXTEL Communications

Ashley Yang, RF Engineer
Joe Glasper , Site Technician

ComSpace Corporation

Dan Ambler, Team Leader System Test
Joel Holyoak, PhD, P.E.

Purpose of Testing:

Cooperative testing between Keller Communications, NEXTEL Communications, and ComSpace Corporation. The purpose of testing was:

1. to review the causes of interference to operation of FM and DCMA systems at specific locations in the Dallas area,

2. to determine if NEXTEL channels were causing/contributing to the interference to the operation of FM and DCMA systems at specific locations in the Dallas area, and

3. to take test measurements to support conclusions of the causes of interference.

Test Equipment:

1. Spectrum Analyzer, Rohde Schwarz, FSEA 30, 1065.6000-35

2. Step Attenuator, Kay Elemetrics Corp, Model 839

3. Antenna, MAXRAD, BMNF8000, ¼ wave, Unity Gain

Summary of Findings:

It was shown that:

1. for all NEXTEL channels tested, each caused an increase in the noise floor for frequencies in the spectral vicinity of the NEXTEL operating frequency ;

   Note: At the first test site, the improvement for shutting down a single NEXTEL channel was 8+ dB. At the second site, the improvement was 6-7 dB when two NEXTEL channels were shut down. Each channel increased the noise floor between 3 and 4 dB. Clearly, the NEXTEL channel at the first site creates a larger increase than either of the channels at the second site.)

2. increase in the noise floor due to the NEXTEL channels at the specific sites tested caused an increase in the noise floor that was sufficient to interfere with the voice quality of a standard FM signal;

   Note: Improved voice quality was observed at the first site when the NEXTEL channel was turned off. Some improvement was noted at the second site when the two NEXTEL channels were turned off.

3. the increase in noise floor was sufficient to impair digital acquisition for a DCMA signal at one of the two tested locations;

   Note: At the second site, with both NEXTEL channels off, the DCMA system was able to acquire and provide for low bit error rate operation.

4. at the second site for which DCMA signals were impaired the NEXTEL site operating in adjacent channel at a site that was close by did not have any negative impact on DCMA operation; and

5. the noise floor was raised from the center frequency of the NEXTEL site to a frequency that was more than 1 MHz but less than 2 MHz away from the center frequency.

   Note: At the first site, the noise floor was raised 8+ dB for frequencies within a 200 KHz region around the NEXTEL channel. At the second site, the noise floor was raised 6-7 dB by two NEXTEL channels. Measurements 1 MHz away from the active channel showed a decrease in noise floor of about 3 dB when there were no other active NEXTEL channels within 1 MHz. Measurements 2 MHz away from the active channel showed a decrease in noise floor of about 6-7 dB.

Test Report Specifics:

Test Date	14 July 2001
Test Location # 1	
Physical Location	Denton Road and Leo
Test Time	Test data collected from 10:30 AM to 11:06 AM
Test Location #2	
Physical Location	Northbound access road Dallas North Tollway North of Keller Springs Road
Test Time	Test data collected from 11:50 AM to 12:58 PM
Report Generated	16 and 17 July 2001

Testing at Location Number 1 – Denton Road and Leo

Test Number	Test Purpose	Test Results
1	Establish spectrum analyzer noise floor and measure noise floor around Keller frequency 852.2375 MHz at Denton Road and Leo. Observe NEXTEL channel at 852.2625 MHz.	Noise floor of analyzer is established at –135 dBm. Noise floor around Keller frequency 852.2375 MHz is established at – 122 dBm. Level of NEXTEL site at 852.2625 MHz is about – 77 dBm.
2	Establish noise floor around Keller frequency 852.2375 MHz when NEXTEL BR at 852.2625 MHz is shut down. Establish level of Keller FM signal at 852.2375 MHz.	Noise floor around Keller frequency 852.2375 MHz when the NEXTEL BR at 852.2625 is shut down is about –130 to –132 dBm. The improvement is between 8 and 10 dB. Level of Keller FM signal at 852.2375 MHz is about – 80 dBm.
3	Demonstrate that the spectrum analyzer is not being overloaded.	A 10 dB attenuator was inserted and both signal and noise dropped the same 10 dB.
4	Screen capture during the audio portion of the test showing levels of FM signal at 852.2375 MHz and NEXTEL channel at 852.2625 Mhz.	Shows FM Signal – level about – 85 dBm and NEXTEL Signal – level about – 51 dBm.
5	Test at 854.3375 MHz to evaluate effect of NEXTEL channel at 852.2625 MHz on DCMA.	DCMA unaffected by NEXTEL channel at 852.2625 MHz.
6	Testing with two BR's at 852.2625 MHz and 860.1125 MHz shutdown.	Total noise floor change of about 10 dB. Noise floor contribution of first frequency, 852.2625 MHz, about 7 dB. Noise floor contribution of second frequency, 860.1125 MHz, about 3 dB.

Testing at Location Number 2 – Dallas North Tollway North of Keller Springs

Test Number	Test Purpose	Test Results
7	Establish spectrum analyzer noise floor.	Noise floor of analyzer is established at –135 dBm
8	Measure noise floor around Keller frequency 855.0125 MHz.	Noise Floor is – 123 dBm that is up almost 12 dB above analyzer reference.
9	Establish level of FM signal at 855.0125 MHz.	FM signal level is at –105 dBm with poor voice quality.
10	Show DCMA signal at 854.3375 MHz in presence of other signals. Establish level of DCMA signal. Show noise floor around DCMA signal.	DCMA signal shown with Plano Public Safety and two NEXTEL sites. DCMA signal level is – 110 dBm. Noise floor is –119 dBm or 16 dB above reference noise floor. DCMA was not functional.
11	Testing of DCMA with NEXTEL channels at 854.6875 MHz and 854.0125 MHz shut down. Establish noise floor around DCMA frequency 855.0125 MHz and determine DCMA functionality.	Noise floor dropped about 6-7 dB when NEXTEL channels at 854.6875 MHz and 854.0125 Mhz shutdown. DCMA fully functional.
12	Noise floor measurement when one of the two channels re-enabled. Channel at 854.6875 turned on.	Noise floor increased about 3 dB.
13	Noise floor measurement when the other channel re-enabled and the first channel shutdown. Channel at 854.0125 MHz on and channel at 854.6875 off.	Similar improvement of about 3 dB in noise floor. Both channels each contribute about 3 dB to the noise floor at DCMA frequency of 854.3375 MHz.
14	Evaluation of potential adjacent channel interference. NEXTEL site at Preston Road and Beltline with frequency at 854.3625 shutdown.	No improvement noted in noise floor and no improvement in functionality of DCMA signal.
15	Measurement of noise floor at NEXTEL channel frequency of 854.0125 MHz.	Noise floor is at – 121 dBm.
16	Measurement of noise floor at 1 MHz away from NEXTEL channel frequency of 854.0125 MHz.	Noise floor at – 121 dBm.
17	Measurement of noise floor at 2 MHz away from NEXTEL channel frequency of 854.0125 MHz.	Noise floor at – 127-128 dBm for 6-7 dB improvement.
18	Measurement of noise floor at NEXTEL channel frequency of 854.0125 MHz when one channel at 854.0125 MHz turned off and when two channels, 854.0125 MHz and 854.6875 MHz turned off.	About 3 dB improvement in noise floor when one channel, 854.0125 MHz, turned off and 6-7 dB improvement when two channels, 854.0125 MHz and 854.6875 MHz turned off.

Testing at Location Number 2 – Dallas North Tollway North of Keller Springs
(Continued)

Test Number	Test Purpose	Test Results
19	Repeat trace with 854.6875 MHz channel on and 854.0125 MHz channel off.	Noise floor improvement about 3 dB.
20	Measurement of noise floor at 1 MHz away from NEXTEL channel frequency of 854.0125 MHz and 325 KHz away from NEXTEL frequency at 854.6875 MHz. Channel at 854.0125 MHz is off and channel at 854.6875 MHz is on.	Noise floor at about –122 dBm Contribution from channel at 854.6875 MHz.
21	Measurement of noise floor at 2 MHz away from NEXTEL channel frequency of 854.0125 MHz and 1.325 MHz away from NEXTEL frequency at 854.6875 MHz.	Noise floor at –127-128 dBm for 6-7 dB improvement. Improvement from 854.0125 MHz channel being off and being 1.325 MHz away from 854.6875 MHz channel.

Representatives from Keller Communications, NEXTEL, and ComSpace Corporation met at Keller Communications.

Nextel engineer, Ashley Yang, noted that she was working on IM studies for the two sites. Other candidates causes for interference were established to be:

1. Broadband noise and
2. Adjacent channel.

Keller FM frequencies were reviewed. They are:

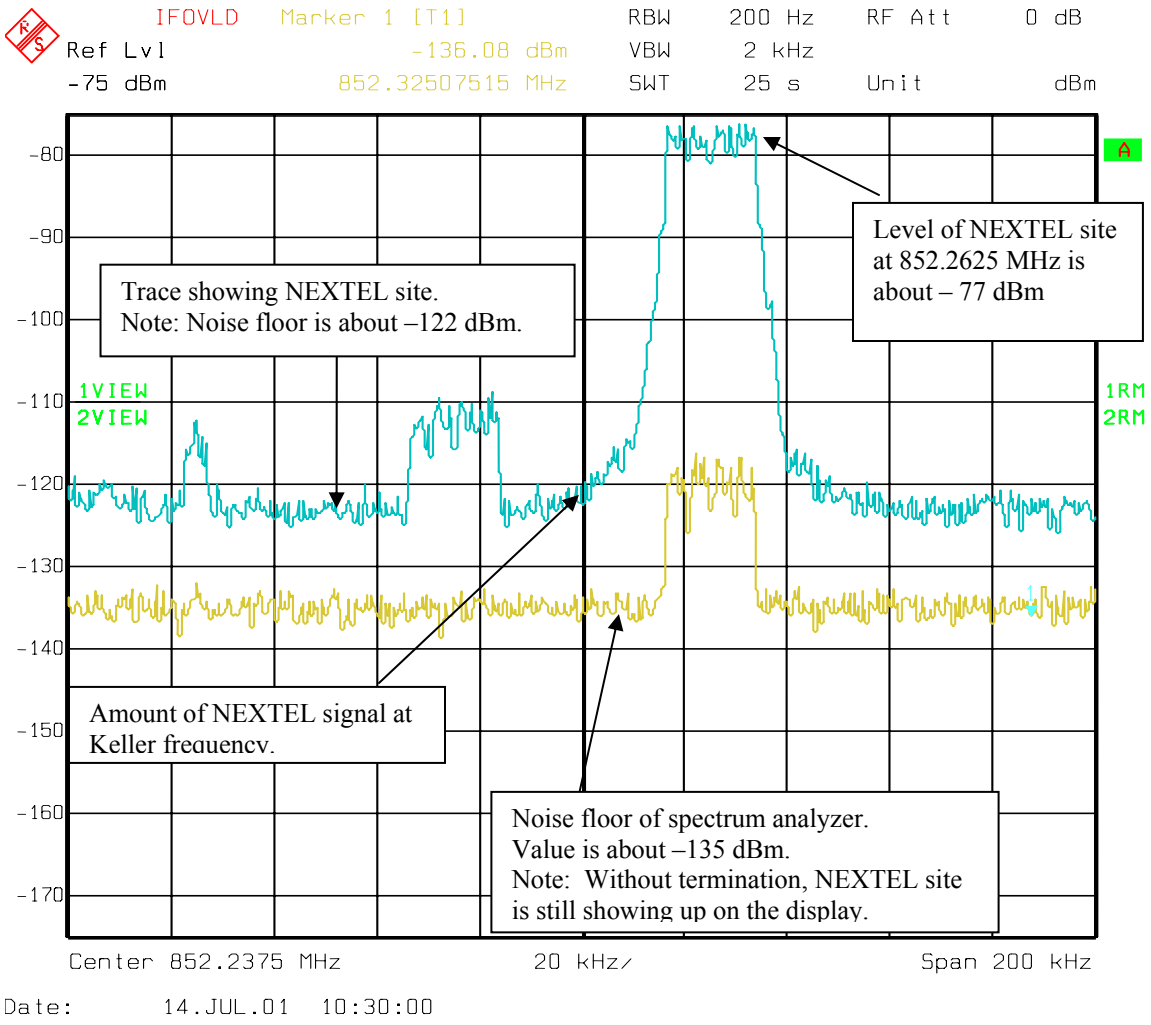
Number	FM Frequency (MHz)	Comment
1	851.0625	
2	852.2375	candidate frequency to be tested at site near Royal and Harry Hines
3	852.3625	
4	852.0125	
5	853.0125	
6	854.3875	
7	854.7875	
8	855.0125	candidate frequency to be tested at site near Dallas North Tollway and Keller Springs road

DCMA frequency was reviewed. The one frequency tested was:

1. 854.3375 MHz.

Initial site was at Harry Hines and Royal. Keller saw no problem and we moved to the other side of the NEXTEL site. We moved over to Denton Drive and Leo (Mapsco 23 J). Keller observed the difficulty with FM communications and testing was done.

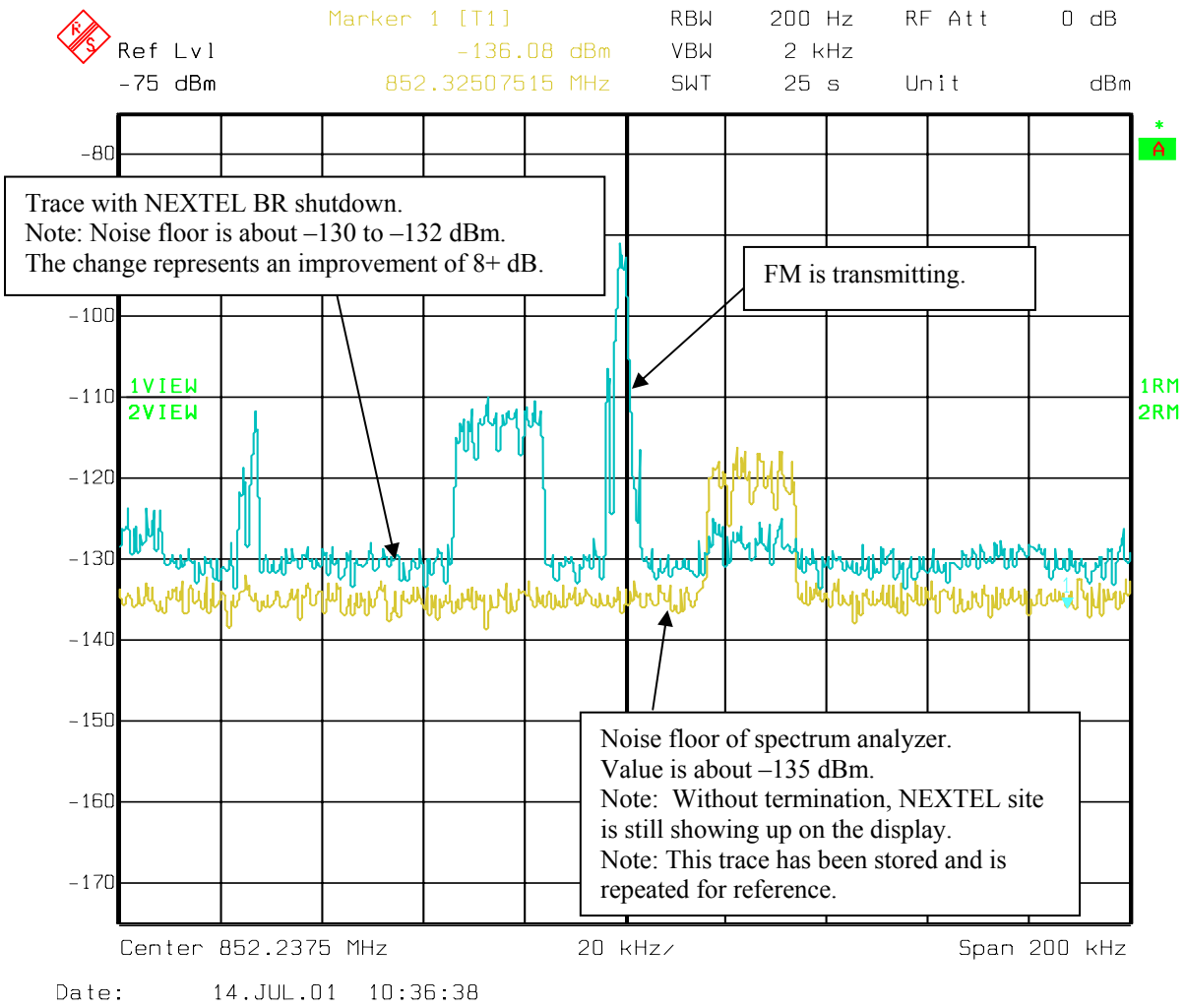
File – Test 1



Frequency span centered on Keller FM frequency at 852.2375 MHz. Captured noise floor of analyzer. The NEXTEL site was sufficiently strong that there was some bleed through. A trace was captured of the NEXTEL site. The noise floor was about –122 dBm. FM at 852.2375 MHz is <u>not</u> transmitting on this plot.

Testing continued by shutting down the BR. The effects are shown on the next graph.

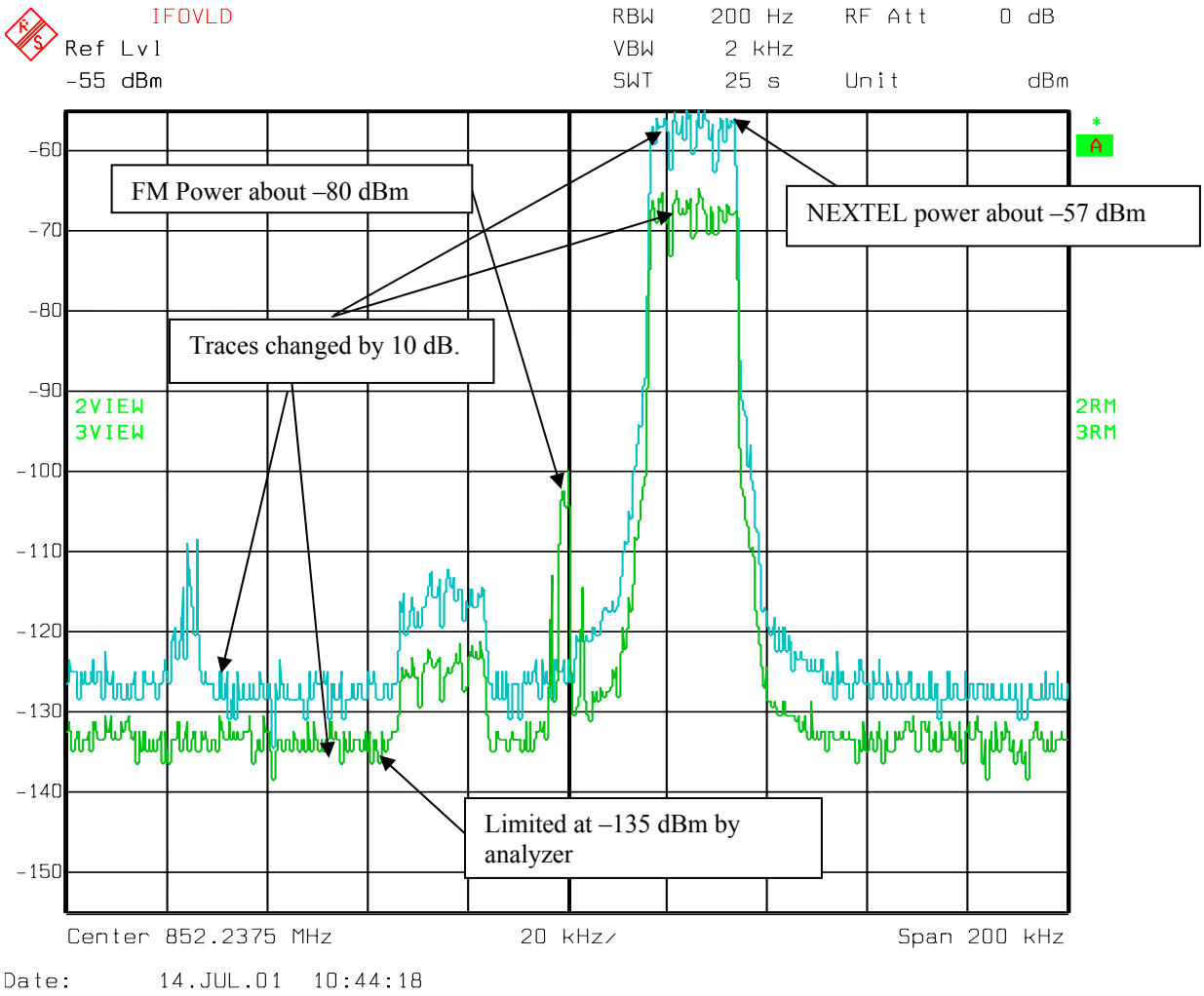
File – Test 2



The BR was shut down and the noise floor dropped about 7 dB.

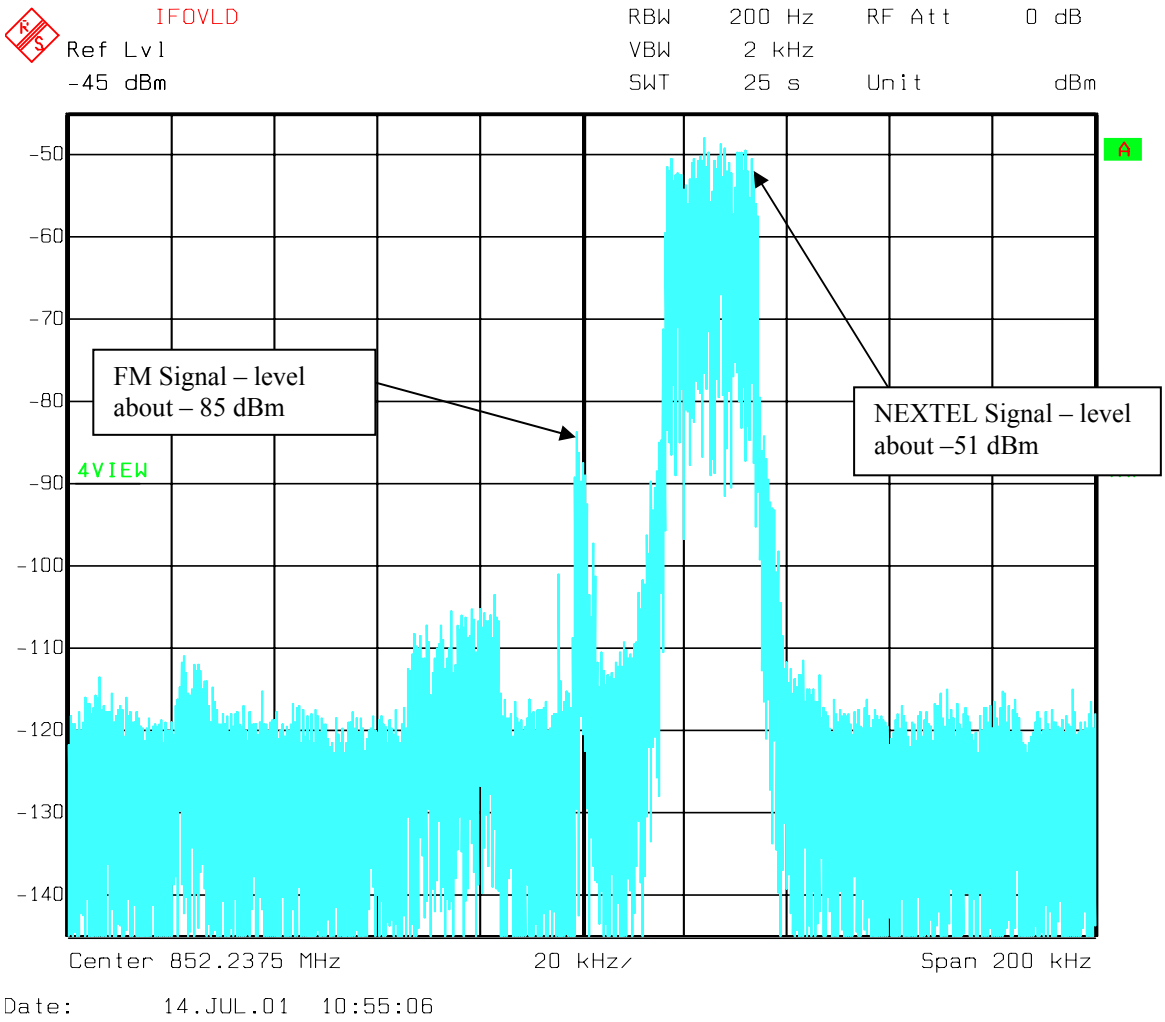
It was noted that the FM voice quality was clearer with the NEXTEL channel 852.2625 MHz turned off.

File – Test 3



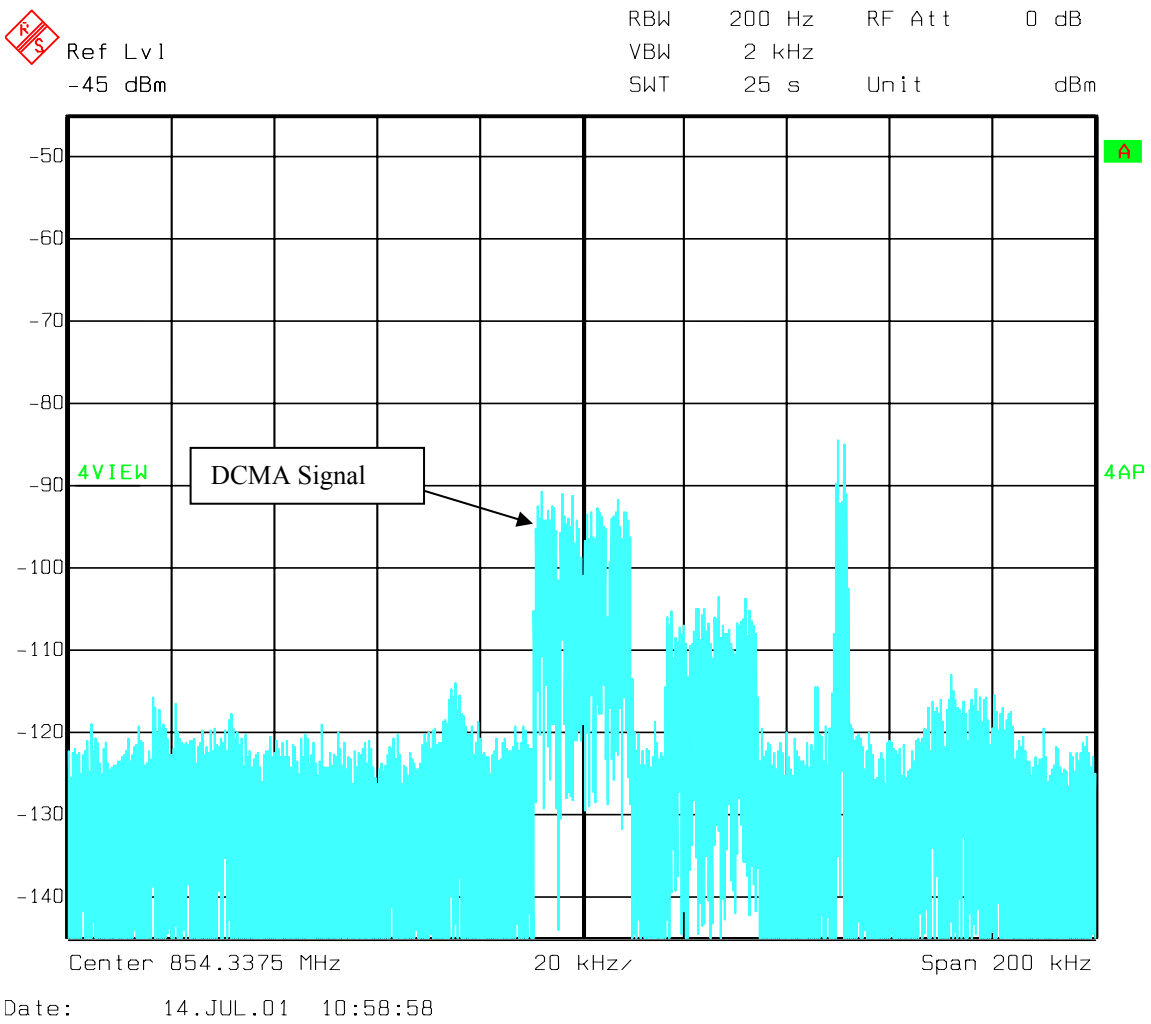
This test was used to demonstrate that the spectrum analyzer was not being overloaded. A 10 dB attenuator was inserted and both signal and noise dropped the same 10 dB.

File – Test 4



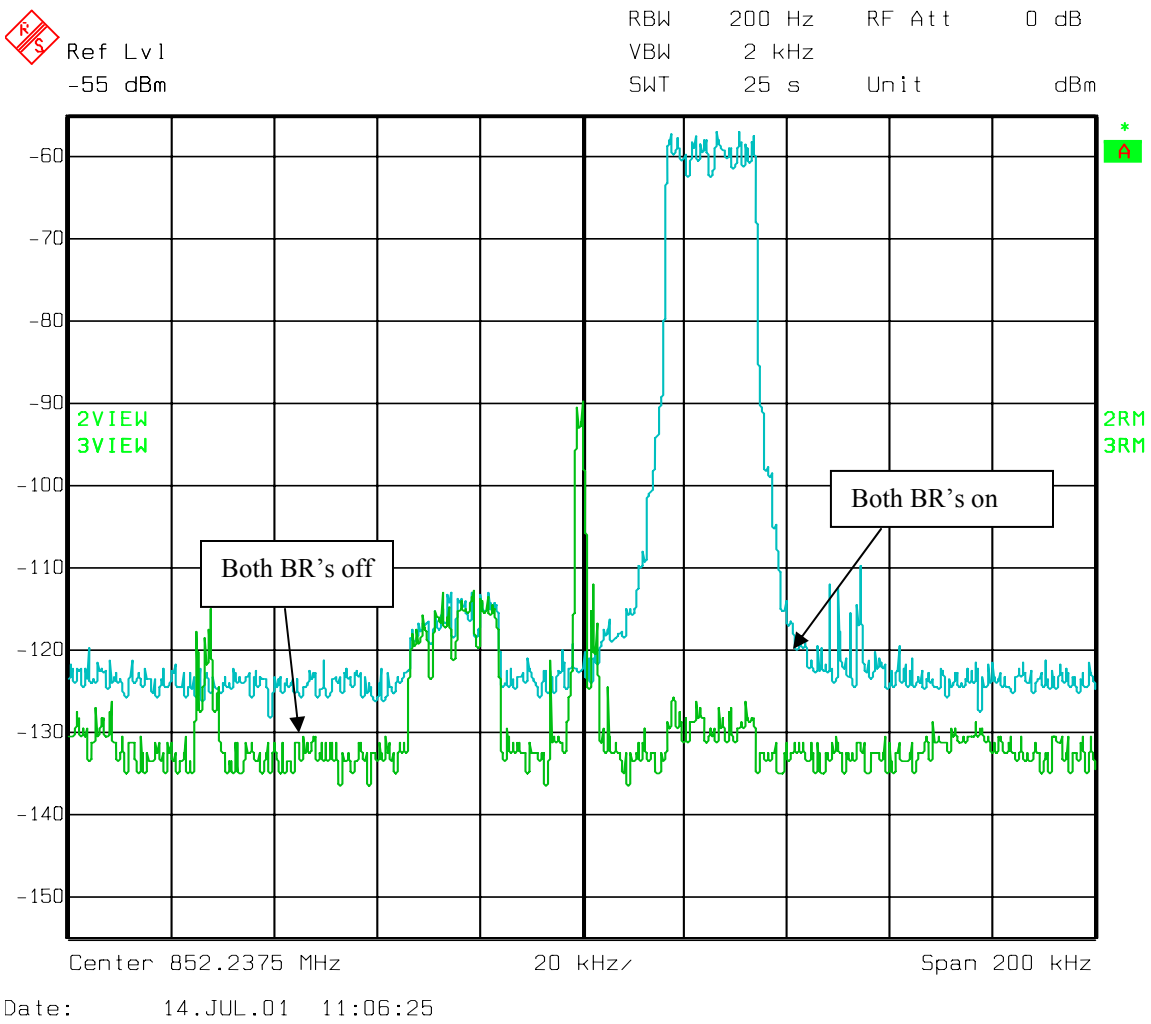
Screen capture during the audio portion of the test. At this point, no FM voice communications were possible.

File – Test 5



Testing now at 854.3375 MHz to evaluate effect of NEXTEL channel at 852.2625 MHz on DCMA. DCMA was unaffected.

File – Test 6

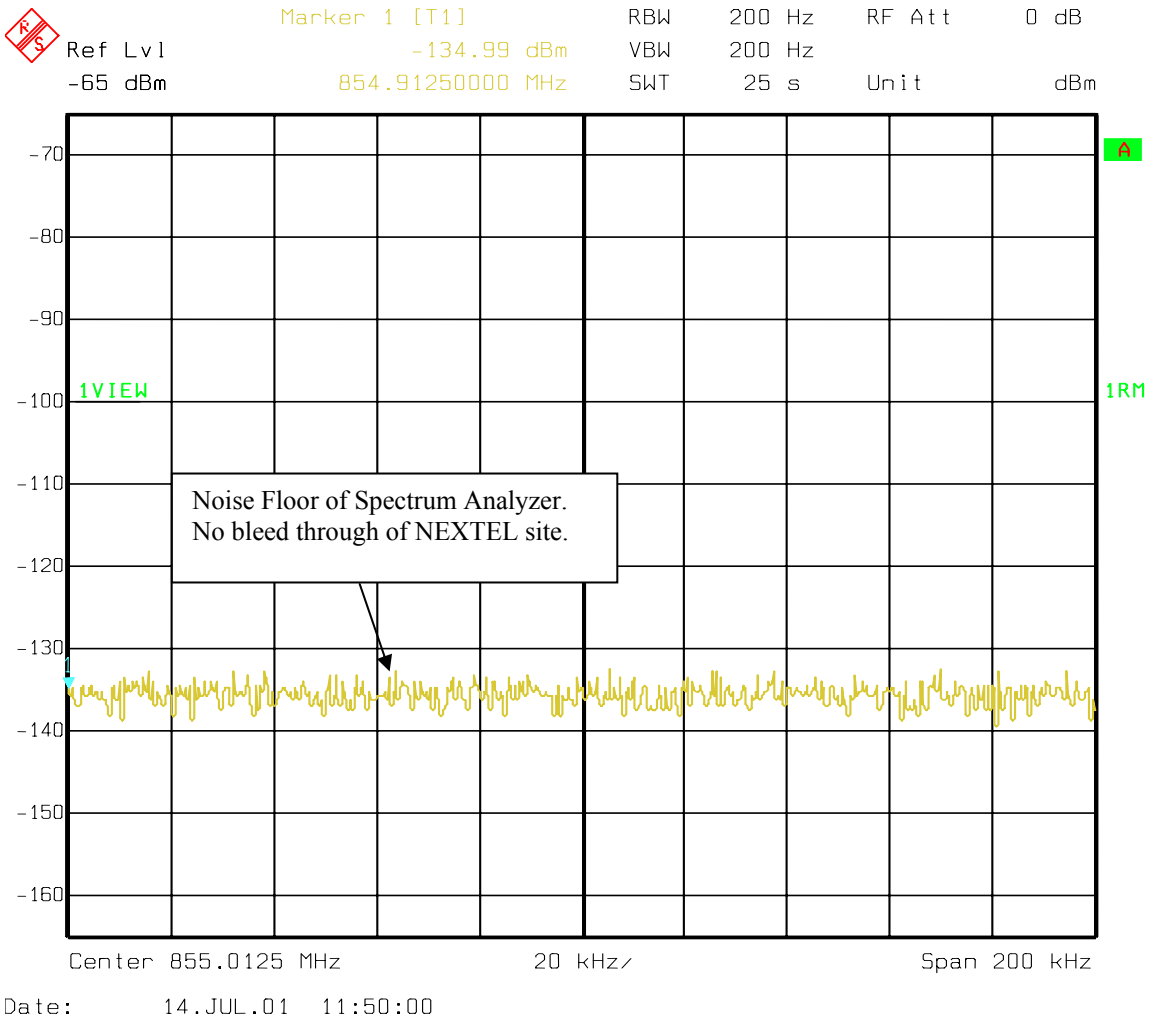


Testing with two BR's shutdown. Frequencies of BR's 852.2625 MHz and 860.1125 MHz.

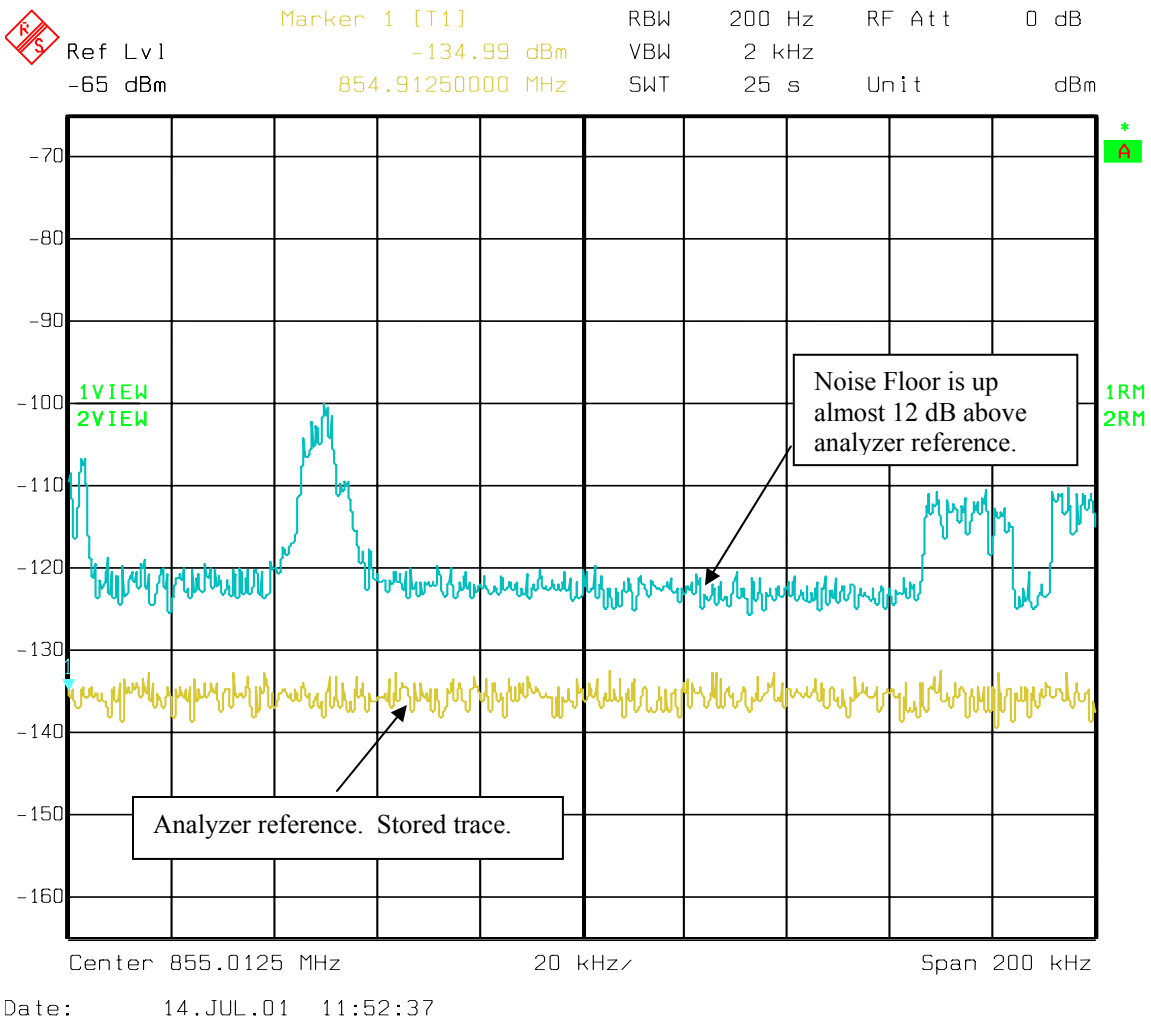
Total noise floor change of about 10 dB. Noise floor contribution of second frequency, 860.1125 MHz about 3 dB.

Testing at Location 2 on Dallas North Tollway Northbound access road North of Keller Springs road.

File – Test 7

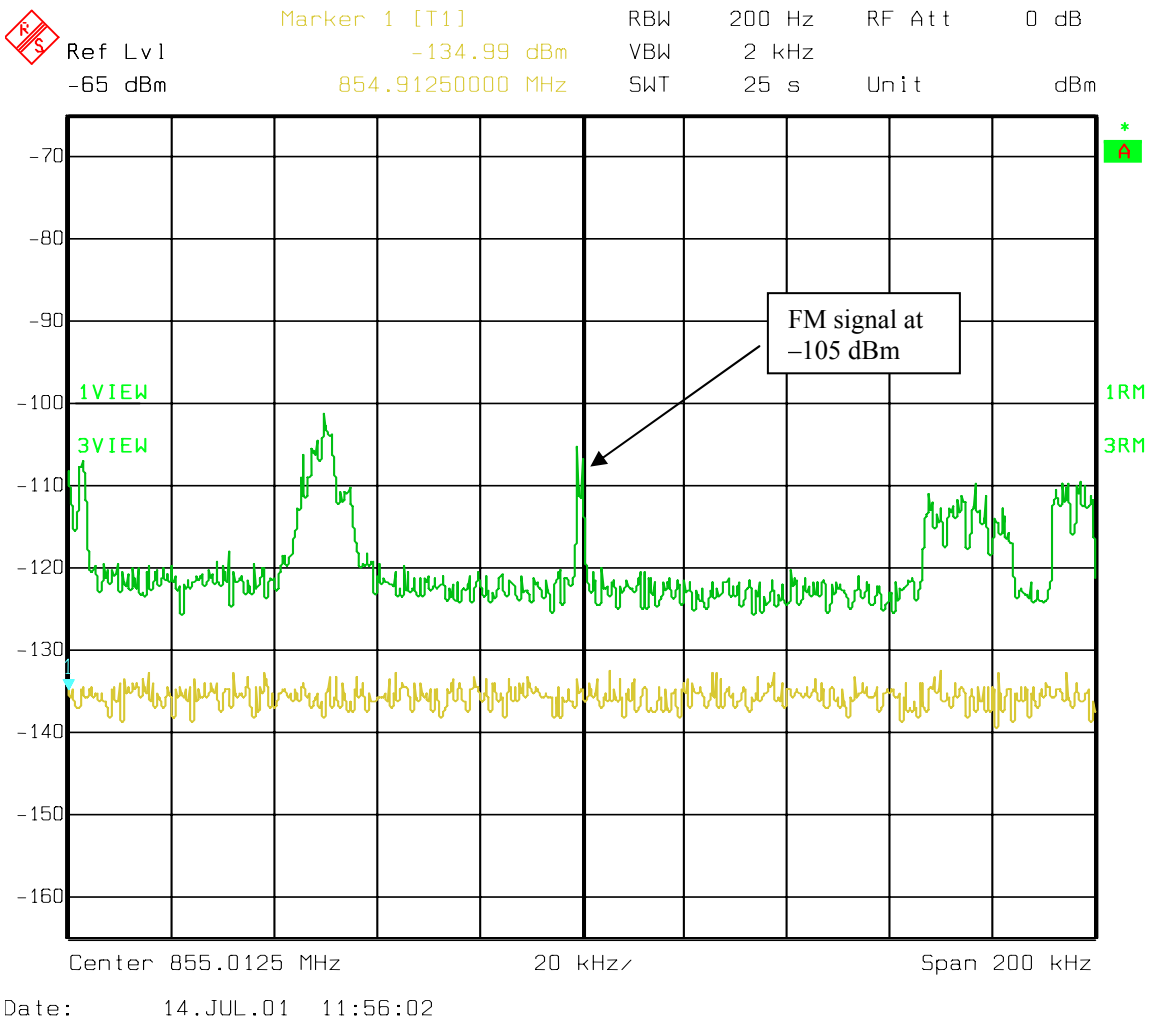


File – Test 8



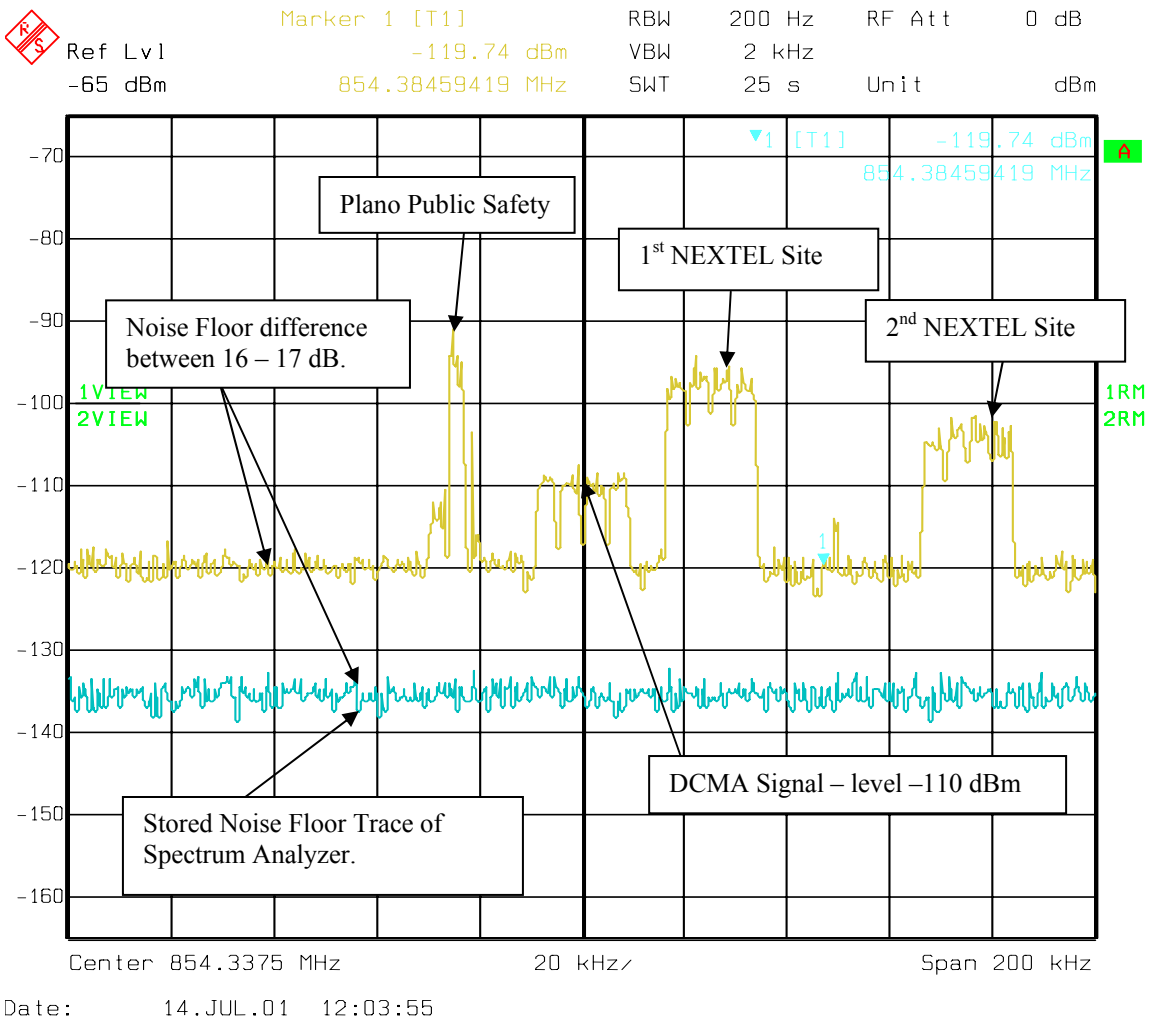
Testing at 855.0125 MHz. Centered at Keller's frequency that has most difficulty.

File – Test 9



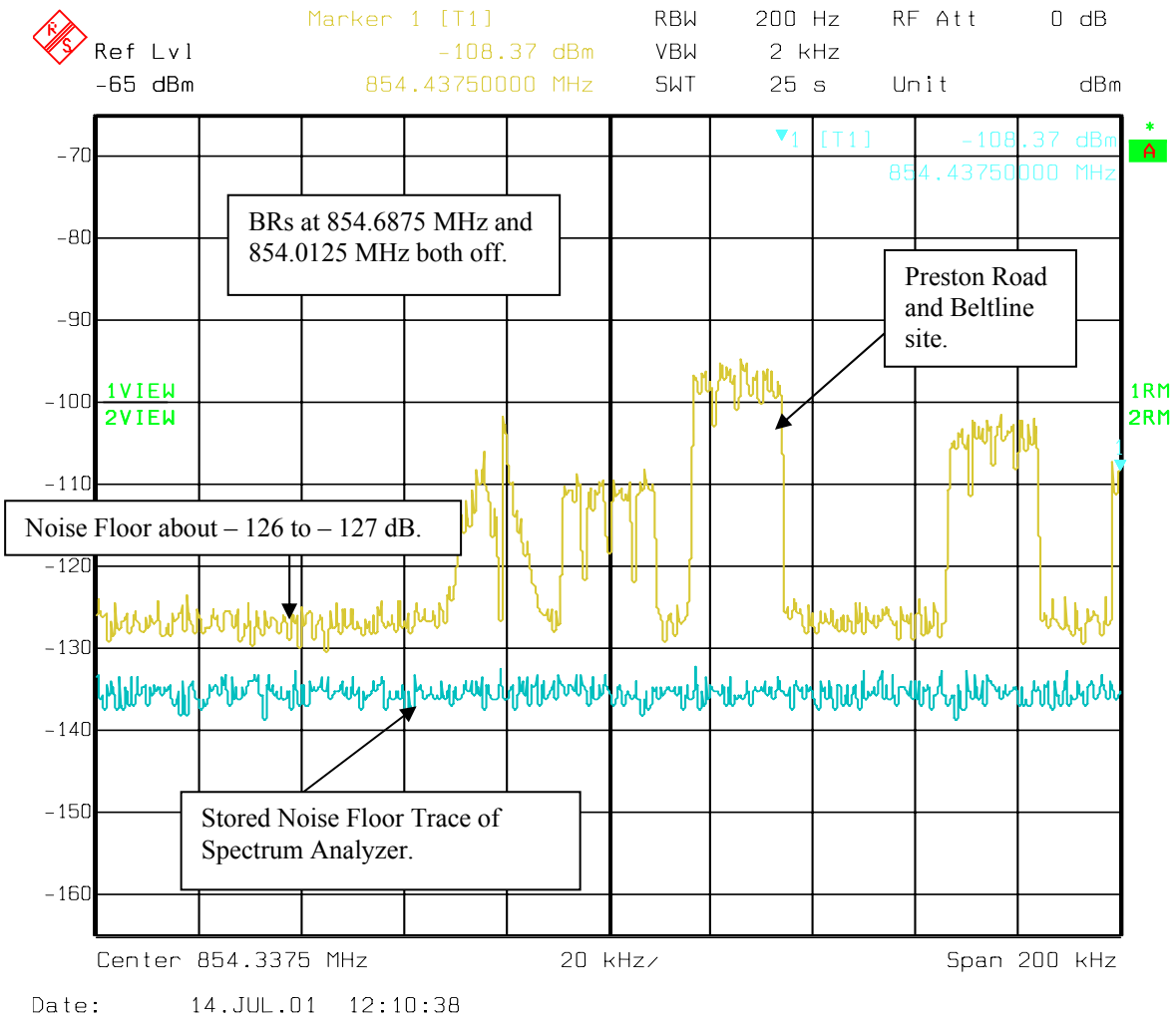
Voice quality of FM signal was unacceptable.

File – Test 10



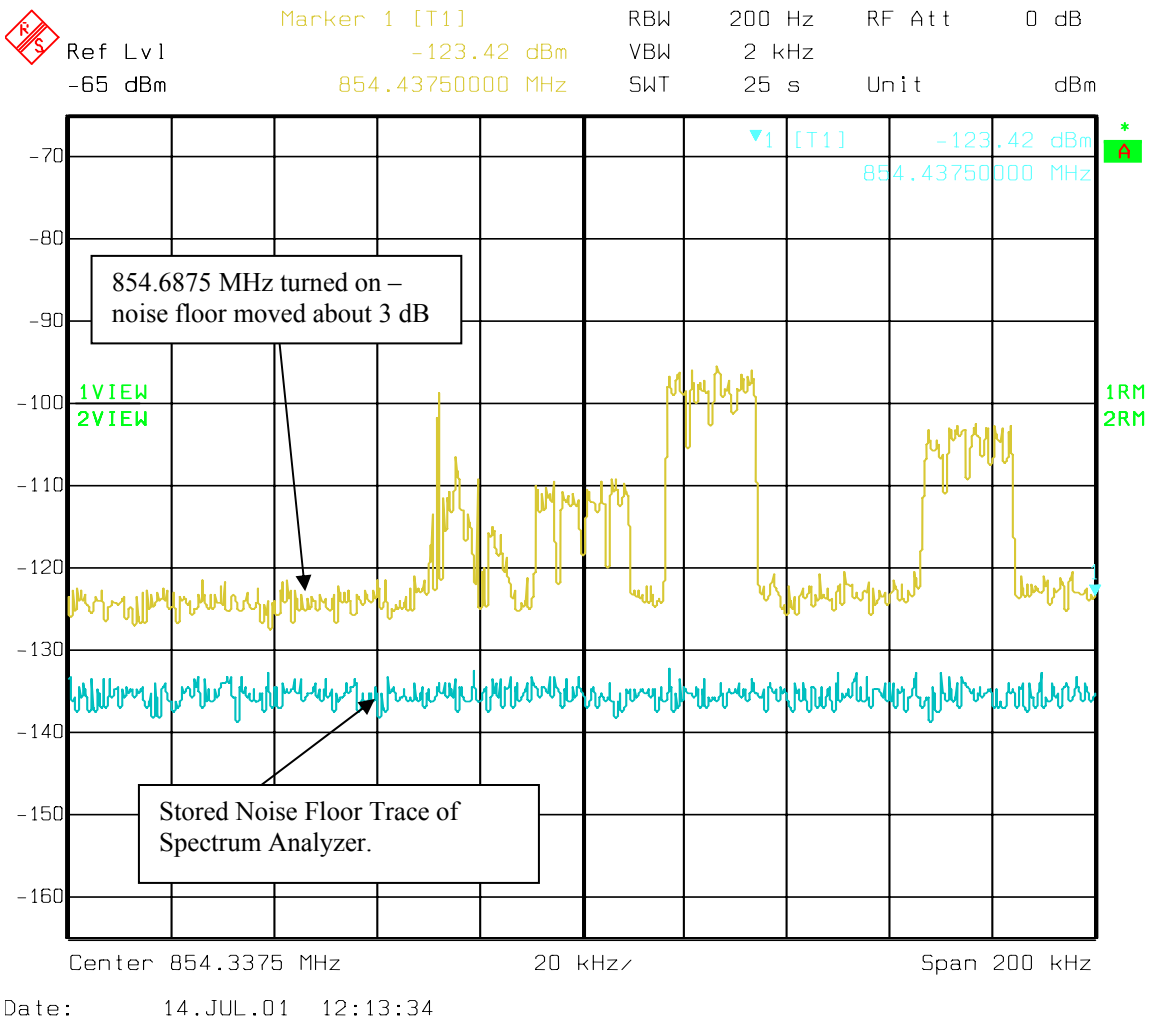
Shows the DCMA signal in presence of other signals. DCMA was not functional in this noise floor level. See next plot in which NEXTEL has turned off two BR's and DCMA is functional.

File – Test 11

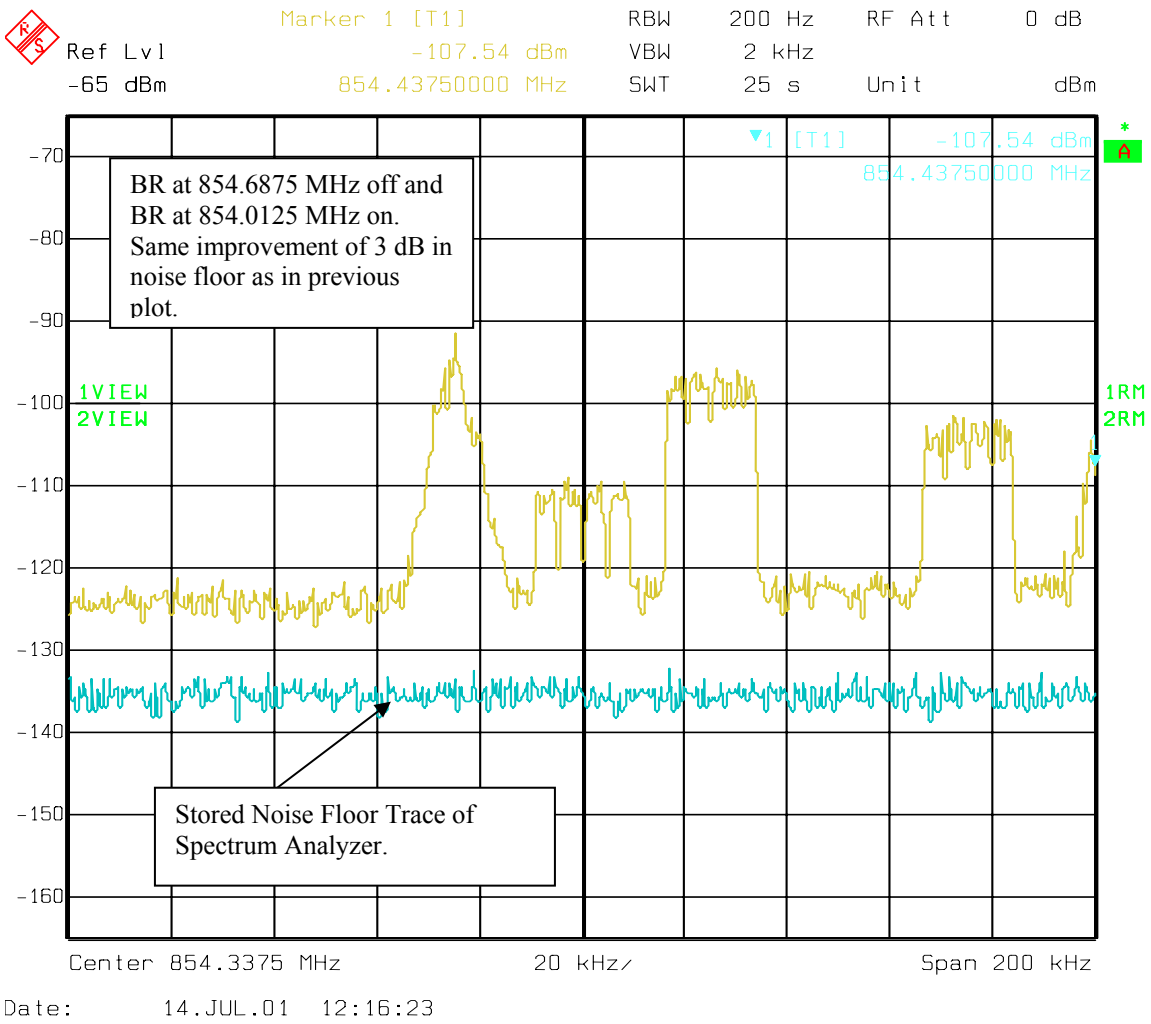


Testing with BRs at 854.6875 MHz and 854.0125 MHz off. Noise floor dropped about 6-7 dB. DCMA fully functional.

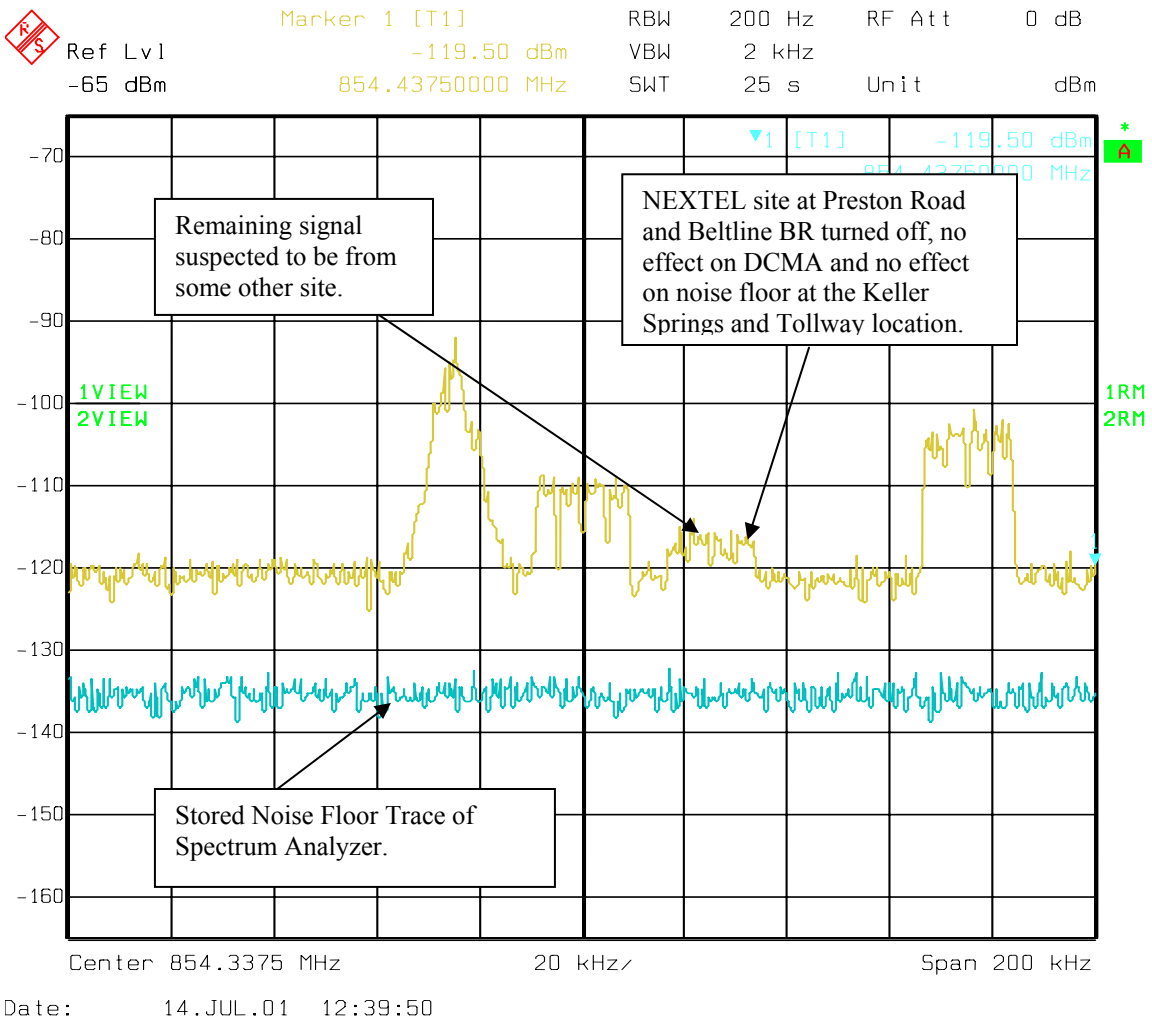
File – Test 12


Marker 1 [T1]
Ref Lvl
-65 dBm
-123.42 dBm
854.43750000 MHz
RBW 200 Hz
VBW 2 kHz
SWT 25 s
RF Att 0 dB
Unit dBm
1 [T1] -123.42 dBm
854.43750000 MHz
-70
-80
-90
-100
-110
-120
-130
-140
-150
-160
1VIEW
2VIEW
1RM
2RM
A
854.6875 MHz turned on – noise floor moved about 3 dB
Stored Noise Floor Trace of Spectrum Analyzer.
Center 854.3375 MHz
20 kHz/
Span 200 kHz
Date: 14.JUL.01 12:13:34

File – Test 13

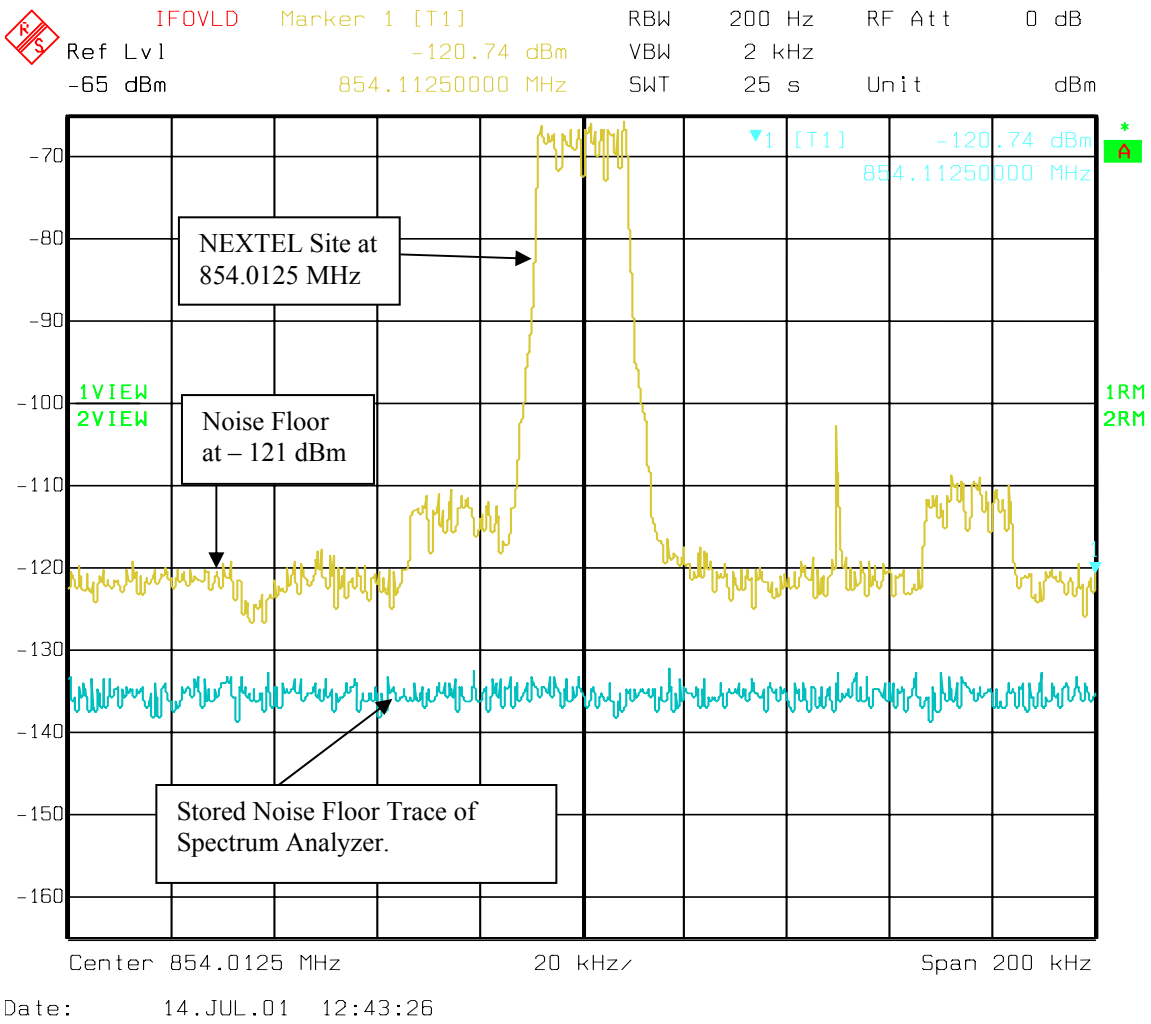

Marker 1 [T1]
Ref Lvl
-65 dBm
-107.54 dBm
854.43750000 MHz
RBW 200 Hz
VBW 2 kHz
SWT 25 s
RF Att 0 dB
Unit dBm
1 [T1] -107.54 dBm
854.43750000 MHz
BR at 854.6875 MHz off and BR at 854.0125 MHz on. Same improvement of 3 dB in noise floor as in previous plot.
1VIEW
2VIEW
1RM
2RM
Stored Noise Floor Trace of Spectrum Analyzer.
Center 854.3375 MHz
20 kHz/
Span 200 kHz
Date: 14.JUL.01 12:16:23

File – Test 14



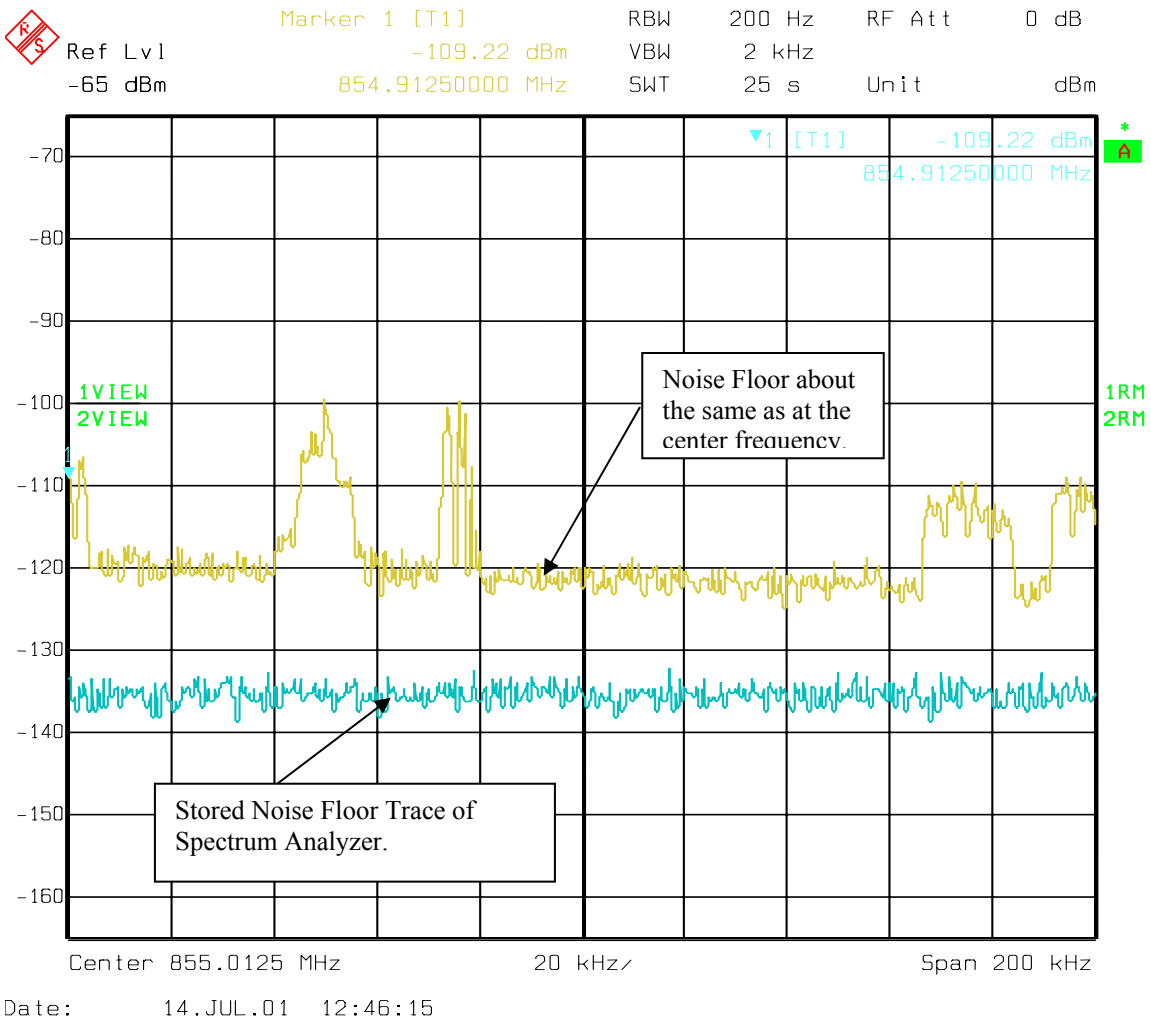
In this test, the adjacent channel site at Preston Road and Beltline was turned off to see it was affecting the DCMA signal. No improvement was noted and the noise floor remained at the –120 dBm level. This test demonstrated that the adjacent channel NEXTEL site was not the interfering signal for the DCMA signal and the DCMA was not fully function when the adjacent channel NEXTEL site was shut down.

File – Test 15



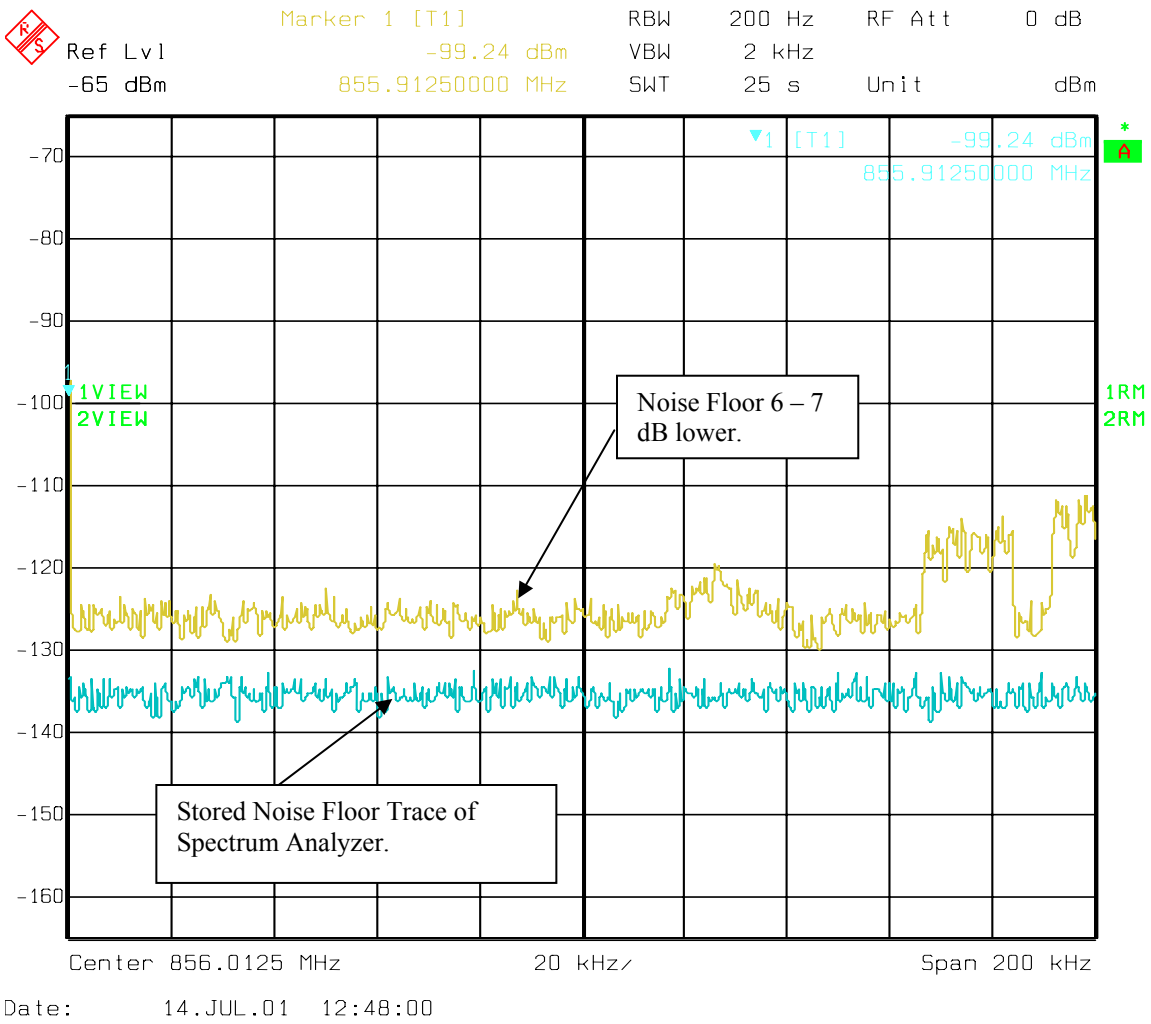
In this test, the noise floor was being checked from the NEXTEL site at 854.0125 MHz.

File – Test 16



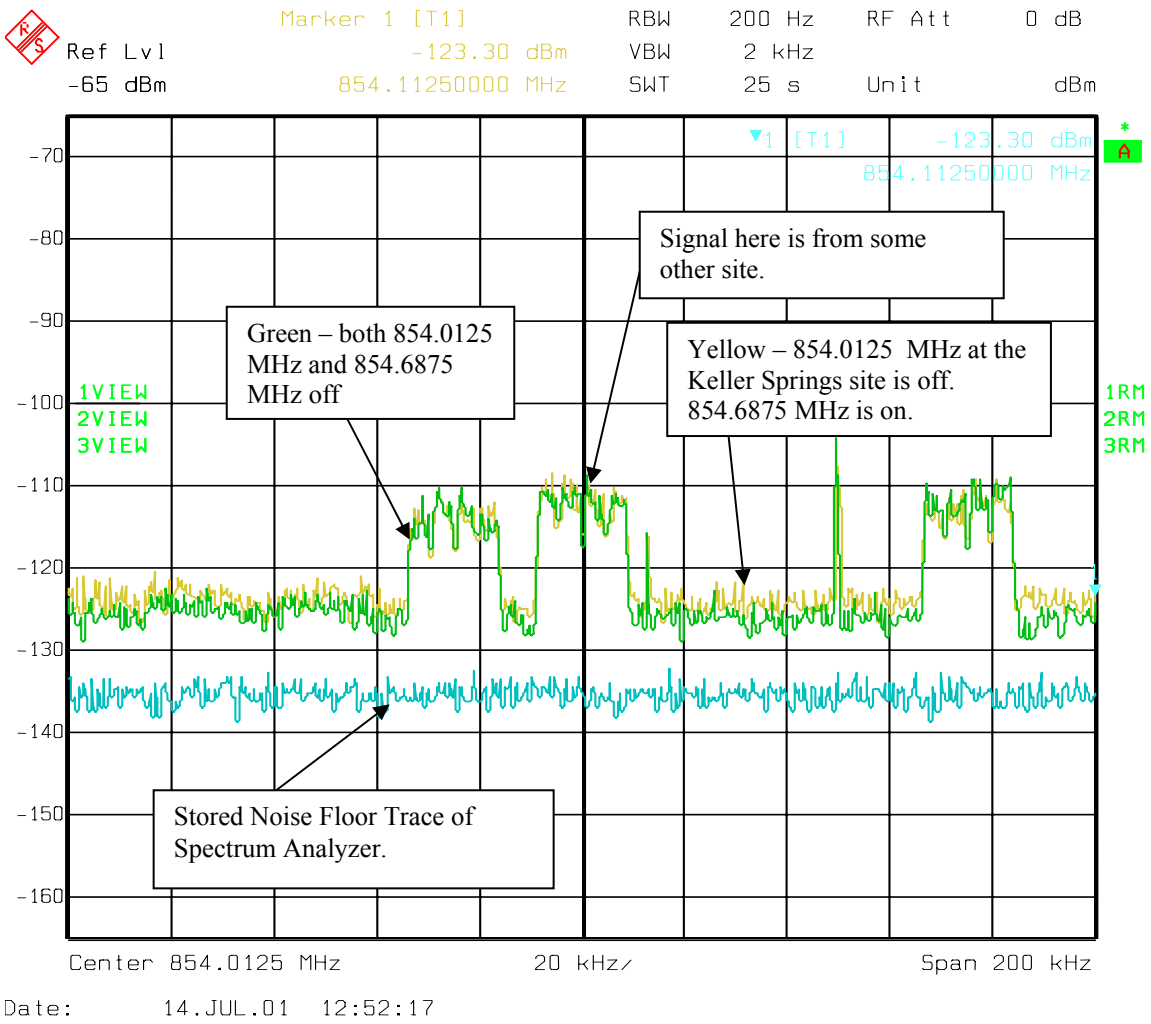
At 1 MHz away from the NEXTEL site at 854.0125 MHz, the noise floor was checked. It was still at the –121 dBm level.

File – Test 17



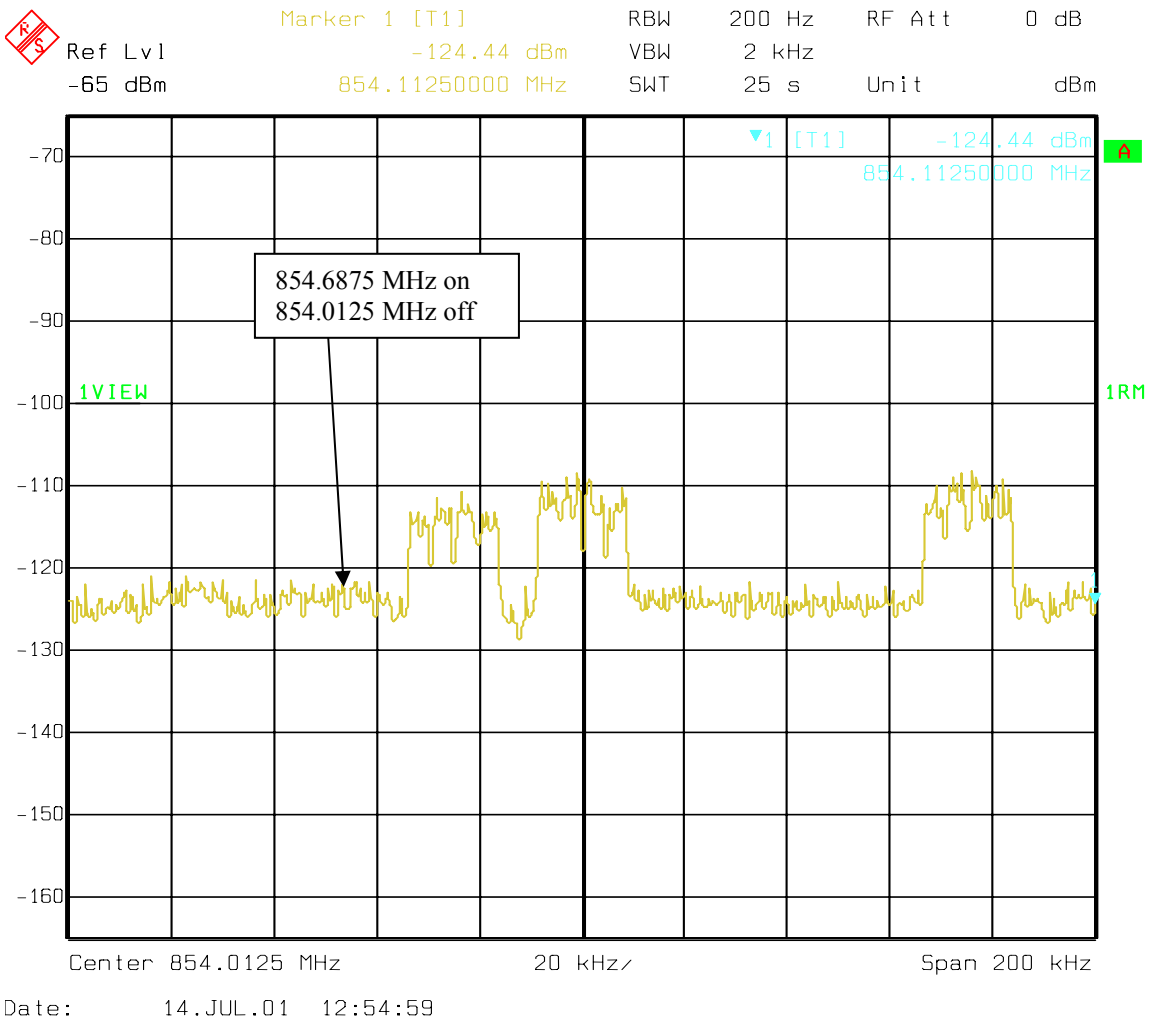
At 2 MHz away from the NEXTEL site at 854.0125 MHz, the noise floor was checked. The noise floor was 6 – 7 dB lower than at the center frequency.

File – Test 18



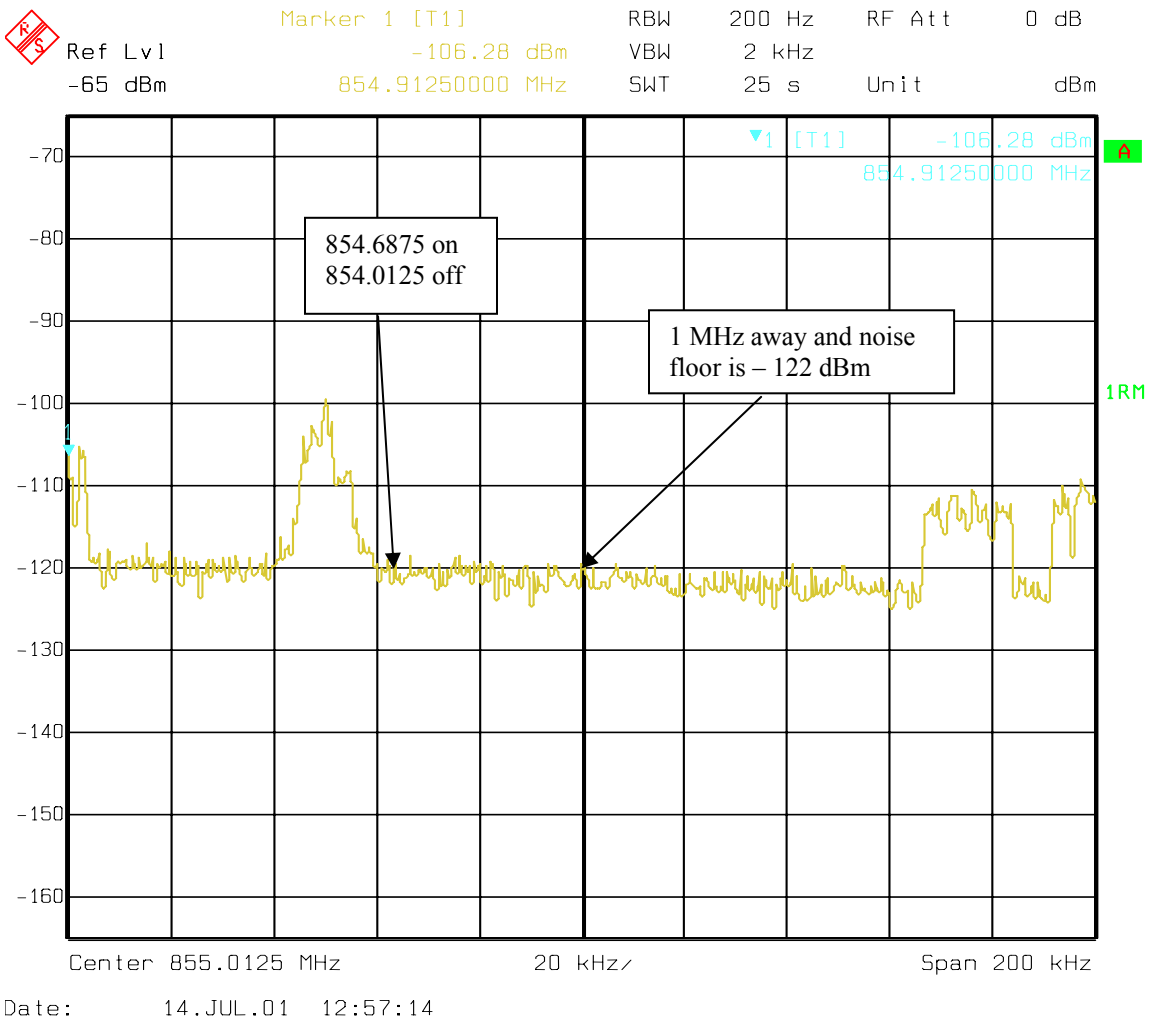
With one BR off, the noise floor is lowered about 3 dB. With both BR's off, the noise floor is lowered 6 – 7 dB.

File – Test 19



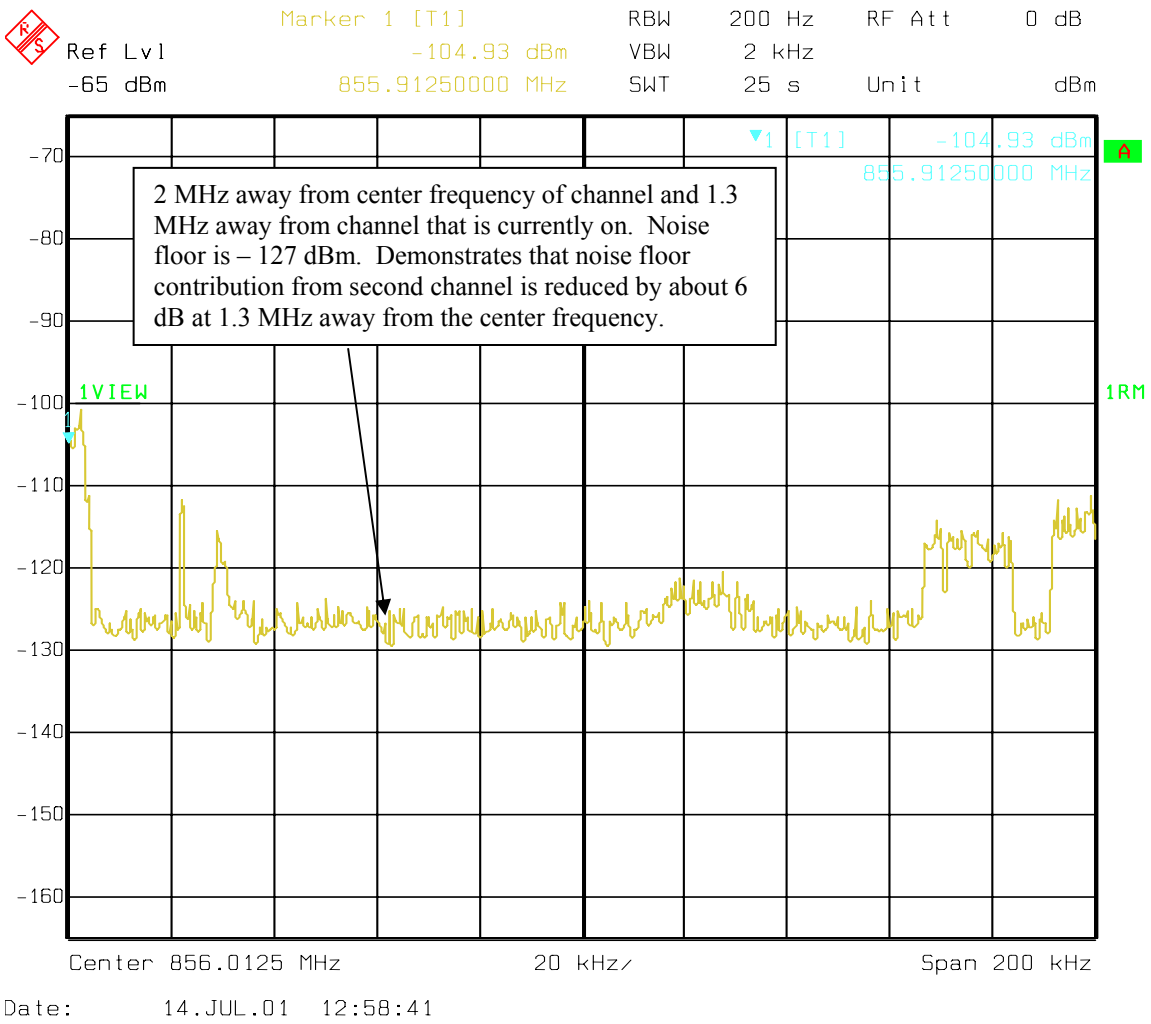
Repeat of trace with 854.6875 MHz on and 854.0125 MHz off. The noise floor is about –123 to –124 dBm and is that which is not contributed the by channel at 854.0125 MHz. It is the 3 dB improvement seen earlier.

File – Test 20



Testing at 1 MHz from 854.0125 MHz. Showing the noise floor has increased to about –120 to –122 dBm There is actually a slight increase in noise floor as the frequency is moved away from the currently off channel. However, the frequency tested is only 325 KHz from the second channel at 854.6875 which is currently on. Hence, the increase can be attributed to the second channel.

File – Test 21



Testing at 2 MHz from 854.0125 MHz. Showing noise floor at –127 dBm. This frequency is 1.325 MHz away from the channel that is currently on.

Joel N. Holyoak, PhD, P.E.

Dan Ambler, Team Leader System Test

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Date: _____ Date: _____