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July 11, 1995

Building The Wireless Future™

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Mr. William F. Caton
Secretary
Federal Communications Commission
1919 M Street, NW, Room 222
Washington, DC 20554

EX PARTE OR LATE FILED

RECEIVED
JUL 11 1995
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Re: *Ex Parte* Presentation
RM-8658

Dear Mr. Caton:

On Tuesday, July 11, 1995, the Cellular Telecommunications Industry Association ("CTIA") represented by Mr. Brian Fontes, Senior Vice President of Policy and Administration; Mr. Randall Coleman, Vice President of Regulatory Policy and Law; Ms. Andrea Williams, Staff Counsel, along with Ms. Jo Waldron and Ms. Michelle Crouch of Phoenix Management, Inc., met with the following Commission staff to discuss issues concerning hearing aid compatibility with wireless technology.

Office of Chairman Reed E. Hundt
Mr. Blair Levin, Chief of Staff

Wireless Telecommunications Bureau
Ms. Regina Keeney, Chief
Mr. Daniel Phythyon, Senior Legal Advisor
Mr. Jay Markley, Telecommunications Policy Analyst

At the meetings, CTIA presented the attached documents. Pursuant to Section 1.1206 of the Commission's Rules, an original and one copy of this letter and the attachments are being filed with your office. If you have any questions concerning this submission, please contact the undersigned.

Sincerely,

Andrea D. Williams

Andrea D. Williams
Staff Counsel

Attachments

No. of Copies rec'd 0+2
List A B C D E

Building the Wireless Future ™

CTIA FAST FACTS

Digital Communications & Hearing Aids

Key Points

The digital electronics revolution brings many benefits to consumers, including advanced wireless communications. However, the pulsed nature of all digital transmissions does have the potential to interfere with other electronic devices. This interaction is not unusual and has happened with other new technologies. The record shows that these compatibility problems are solvable. The wireless industry is doing something about solving the problem.

- The basic laws of physics dictate that, because of their pulsed nature, all digital transmissions have the potential to interfere with other electronic devices. This potential, however, can be mitigated or eliminated through the cooperative activities of the parties involved.

- The first step is to quantify the compatibility characteristics for interaction between various electronic devices. Then specific "fixes" can be identified and incorporated in the making or use of affected products.

- In 1994, the wireless industry supported the establishment of an independent laboratory, the *Center for the Study of Wireless Electromagnetic Compatibility* at the University of Oklahoma. The Center is conducting a program of research and development with the manufacturers and users of these devices, and has access to a multi-million dollar electromagnetic testing facility -- the finest in the world.

In a competitive free market, the challenge of compatibility between various electronics devices is not uncommon. The analysis of acceptable solutions always involves power, distance and shielding, or some combination of the three.

- There are three ingredients to solving unacceptable electronic interaction: (1) decrease the emitted signal strength; (2) move the interference-prone device away from the signal; (3) block the signal by increasing the shielding around the target device.

- The compatibility issue is not new to technological advances. It has occurred before -- and been resolved -- in other consumer products such as microwave ovens, electronic air bags, automatic brake systems, etc.

This is <u>not</u> a public health or safety issue, but rather an issue of interaction management.

- Interaction between digital phones and hearing aids is not a casual exposure kind of problem. For interaction to occur, the distance between the phone and hearing aid must be very short. Ways of eliminating or mitigating the problem are readily available. Different types of hearing aids offer different levels of shielding. Some hearing aids are already immune to digital interaction.

- more -

- Wearers of non-"hardened" hearing aids, however, can continue to use analog wireless phones (the type most frequently in use today) with no interference. They are also not likely to experience interference from other people's digital phones, for instance walking down the street or being around digital phone users.

- People with hearing aids that have a t-coil/switch will be able to use interconnect systems, like HATIS, to have compatible access to analog and digital cellular phones. Hearing aid users are not likely to experience interference from other people's phones, because of the distance between the phone and the device.

- Each hearing aid is a prescription device, designed for the needs of the wearer. There are three different types of hearing aids, each with an increasing amount of immunity: (1) behind the ear, (2) in the ear, and (3) in the ear canal. Hearing aids that fit in the ear canal and in the ear are less susceptible than behind the ear units.

- After studying the matter, the Australian government issued a report that this was not a health problem and that there were multiple solutions for hearing aid wearers.

Key Questions and Answers

Q. Do digital wireless phones interfere with U.S. hearing aids?

A. To varying degrees, all digital wireless technologies have the potential to interfere, as can fluorescent lights, computers, and other electronic devices. The way to eliminate such interaction always involves power, distance and shielding, or some combination of the three . The success of other industries in overcoming similar compatibility issues demonstrate that a solution will be found.

Q. But isn't this simply a GSM digital phone problem?

A. Today there are about 10 million GSM phones in use and there has not been any outbreak of hearing aid problems. While CTIA is technology neutral, we observe that in an effort to gain a competitive advantage, the backers of one technology are attempting to discredit another. Our mothers always taught us that you can't build yourself up by tearing the other person down, but that lesson seems to be lost in this instance. Such tactics create concern about all wireless technologies where it need not exist.

Q. Why doesn't the industry just ban all digital phones until an interference solution is found?

A. There is no need to ban digital phones. As Australia's National Acoustics Laboratory study indicates, there are solutions that can mitigate interaction between digital phones and hearing aids. In the United States, the wireless industry is already working cooperatively with hearing aid manufacturers to ensure that all Americans enjoy the benefits of both wireless phones and hearing aids.

Q. Does this pose a health risk?

A. No. It is an issue of interaction management and ways of eliminating or mitigating the problem are readily available. The compatibility issue has been raised as a strategic component of a new struggle for market share among competitive digital technologies. CTIA does not take sides in this competitive technology battle, but feel wireless customers benefit by system operators having a choice of several digital technologies. This compatibility challenge is part of forward progress, it is unavoidable -- but it is also solvable.

Q. What can hearing aid wearers do to avoid interference from digital phones?

A. Some hearing aids are already immune to digital interaction. Wearers of non-"hardened" hearing aids, however, can continue to use analog wireless phones (the type most frequently in use today) with no interference. They are also not likely to experience interference from other people's digital phones, for instance walking down the street or being around digital phone users.

Q. What is being done about this issue?

A. The Center for the Study of Wireless Electromagnetic Compatibility at the University of Oklahoma, has developed a research protocol designed to quantify the source of any problem and recommend solutions. The European Community has already recommended new hearing aid standards, making them more resistant to interference from all extraneous sources. In May 1995, the National Acoustic Laboratories in Australia published the findings of a GSM/hearing aid interaction that said the level of interaction varies depending on the type of hearing aid. It also reported how interference between a two-watt GSM phone and hearing aids can be solved through interaction management. The study demonstrated that it is possible to design high-immunity hearing aids, as well as design and use digital mobile telephones in ways to minimize the problem of interaction with hearing aids.

Key Facts

- In digital transmissions, a conversation is converted into the ones and zeros of computer code, which is sent as a pulse rather than a continuous wave (as with analog). This allows you to transmit more than one conversation at a time on the same radio frequency. By using digital technology, it is possible to handle more customer calls, improve call quality, and introduce new feature capabilities.

- Much like the "Betamax vs. VHS," or "Apple vs. DOS" format battles, wireless system operators must choose one of several different digital technology standards to deploy. Efforts by some appear to be designed to slow down or block the GSM digital technology in favor of another technology, CDMA.

- In 1994, the Center for the Study of Wireless Electromagnetic Compatibility at the University of Oklahoma was created with seed money from the wireless industry. This organization exists for the sole purpose of harmonizing the growth of wireless technology with other electronic devices. At a recent two-day Center forum, one researcher pointed out that recent public attacks could hurt rather than help hearing aid users. He presented statistics regarding overall reluctance to admit to the need for a hearing aid. The kind of negative perception of hearing aids created by this controversy, he warned, could have the impact of further discouraging those in need of help from seeking it.

- Responding to concerns about interference to hearing aids, medical devices and other electronic equipment, European standards organizations have extensively studied the potential for interference. Results of the European testing (on phones operating at twice the peak power as U.S. GSM) concluded that although there was no public health or safety problem, there was the potential for GSM to cause interference to some hearing aid users.

- The European solution was to propose an increased immunity standard to 10 V/m. The European Hearing Instruments Manufacturers Association is also investigating how to measure and mitigate interference in the increasingly dynamic electromagnetic environment and how to design hearing aids with sufficient immunity levels.

- In May 1995, the National Acoustic Laboratories in Australia published the findings of a GSM/hearing aid interaction study, initiated by Telecom Research Laboratories, AUSTEL (the telecommunications industry regulatory body), the Deafness Forum of Australia, the Spectrum Management Agency, and hearing aid suppliers including Australian Hearing Services. The study said the level of interaction varies depending on the type of hearing aid. It also reported how interference between a two-watt GSM phone and hearing aids can be solved through interaction management. The study demonstrated that it is possible to design high-immunity hearing aids, as well as design and use digital mobile telephones in ways to minimize the problem of interaction with hearing aids.

- In a paper presented to the GSM World Congress, held in Madrid from February 7-9, 1995, Stuart Sharrock, Editor, *Mobile Communications International*, stated:

  "Clearly there is a potential problem. Not a safety problem but a problem that GSM may cause irritating and annoying interference to hearing aid users and domestic audio equipment. Hearing aid users are not unfamiliar with interference problems, interference caused by florescent lights is in fact generally worse than interference from GSM phones.... To put these figures into context, note that field strengths of 5 V/m can be generated by interior electronic wiring, a hair dryer produces around 50 V/m and an electronic razor 100 V/m. Overhead power lines generate field strengths in the region of 100 V/m and electric fields during thunderstorms produces up to 20,000 V/m"

- A fact sheet issued in Oct. 1994 by the British Royal National Institute for Deaf People concluded:

  "Hearing aids do not last forever, and it is hoped that new hearing aids will be less affected by interference. Several organizations, including hearing aid manufacturers, are investigating the problem, and hearing aid manufacturers are working towards designing hearing aids that pick up less of the interference. That is why it is important to have a standard way of measuring the immunity of hearing aids. This standard is being developed as quickly as possible so it will be possible to compare hearing aids, and hearing aid purchasers will be able to buy hearing aids with high immunity."

- Ole Lauridsen, Professor, MSc. E.E., Corporate Director R&D, Tele Danmark Research wrote the following in a Letter to FCC Chairman Reed Hundt on March 26, 1995:

  "In my little country of Denmark, over 250,000 people (4.8 % of the population) are currently using GSM telephones on two competitive, nationwide networks and not one single complaint has been received by the Danish Telecom inspector from hearing aid users, car owners, hospitals, airports, medical equipment suppliers, consumer protection agencies, etc."

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News Media Contact: Mike Houghton (202)736-3207
Industry Contact: John Breaux, Jr. (202) 736-2992

HEARING AID COMPATIBILITY

- All digital technologies have the potential to interfere or interact with electronic devices. The degree and the nature of the interference or interaction will vary.

- Electromagnetic interaction ("EMI") between wireless telephones and hearing aids is an interference management issue, not a public health or access issue. To understand EMI between wireless telephones and hearing aids and to develop viable solutions, one must understand the auditory environment in which hearing aid users live.

- The industry has a comprehensive, responsible program underway to work in cooperation with hearing aid manufacturers and industry standards bodies to quantify the nature of the interference and develop long-term solutions. This effort is being coordinated by the University of Oklahoma Center for the Study of Wireless Electromagnetic Compatibility.

- Interim solutions exist today:

    - digital interaction is not an issue for all hearing aids
    - switch ears, don't use the telephone in the ear with the hearing aid
    - Use a digital telephone which comes with a plug-in extension device (a Walkman-like miniature speaker/microphone combination which fits in or around the ear, thus allowing the digital unit to be kept away from the ear and eliminating interaction)
    - use an analog wireless telephone (25 million people already do)

About Digital Wireless Devices
and
Hearing Aids

Responsible providers of telecommunications products and services are concerned about the hearing impaired.

- Interaction with other electronic devices is a natural byproduct of the evolution to the digital age. The challenge has been seen before and solved before in circumstances as diverse as car radios, anti-lock brakes and garage door openers.
- In Europe, the solution is already in place. As of January 1, 1996, all hearing aids sold in the European Community must be immune from normal digital interaction such as that from digital phones (*Note:* European GSM phones have a signal which is two to eight times more powerful than the US standard for digital portable phones.)

Digital interaction is not a matter of casual or accidental exposure.

- The National Telecom Agency of Denmark report (cited in the HEAR-IT NOW petition to the FCC) states, "82% of hearing aids were not disturbed by persons other than the aid user using hand portable 2 W GSM telephones." *Note:* the 2 W model tested is *twice* the power of US digital phones.

Digital interaction is not an issue for all hearing aids.

- Dr. Ole Lauridsen, a Danish telecommunications engineer, development manager for the hearing aid industry and author of another study cited in the HEAR-IT NOW petition, wrote FCC Chairman Reed Hundt, "In the existing population of hearing aids, one third had the immunity to be used with a [higher-powered, European] GSM telephone."
- The Denmark National Telecom Agency study also found, "Out of the total of hearing aids, 16% are immune to the extent that they can be used together with a hand portable GSM telephone used in the same ear as the hearing aid." (Again, at *twice* the transmission power of US digital portable phones).
- A 1995 Australian government study found," [E]xtremely high immunity is required to enable a hearing aid wearer to use a hand-held GSM telephone. Such immunity is achievable for some hearing aids." (Again, the tests were conducted at *twice* the power of the US portable phone standard).

Today **there are readily available solutions for hearing aid users.**

- For many, their hearing aid is immune to digital interaction (see above).
- Switch ears, don't use the phone in the ear with the hearing aid.
- Use a digital phone which comes with a plug-in extension device (a Walkman-like miniature speaker/microphone combination which fits in or around the ear, thus allowing the digital unit to be kept away from the ear and eliminating interaction).
- Use an analog wireless phone (25 million people already do).

Tomorrow **there will be even more solutions -- they're already happening in Europe.**

- After January 1, 1996, all hearing aids sold in Europe must have immunity levels sufficient to prevent interaction from the higher power European digital phones.
- A study by the Australian government concluded, "A very high level of immunity can be designed into hearing aids. Four effective means for increasing immunity in hearing aids were demonstrated...Reduce the lead lengths in the hearing aid... Surround the amplifier with an electrostatic shield [as simple as a coat of silver-based paint]...Use shunt capacitors...Impregnate the plastic case parts..."
- The research of Dr. Ole Lauridsen, submitted by HEAR-IT NOW in support of its FCC petition, concludes, "In the very near future, i.e., after January 1st 1996 only equipment that fulfill the EMC directive may be brought to market...There is therefore no reason to discard the TDMA option due to EMC considerations."

The average life of a hearing aid is limited, thus providing an opportunity for rapid adoption of higher-immunity devices.

- The Australian government's study reported, "[T]he average hearing aid has a lifetime of only five years, the issues could be usefully addressed through the normal replacement cycle if suitably hardened hearing aids could be made available within a few years."
- Until the hearing aid is replaced as a matter of natural course, there are interim solutions permitting use of a wireless phone (see above).

Rather than exploiting the hearing aid issue as a part of a market share struggle, it is important to get on with immunity enhancement in hearing aids.

- The kind of immunity enhancement which has been undertaken in Europe will benefit hearing aid users in ways *far beyond digital telephones.* Interference is a common problem for hearing aid users (and becoming increasingly so as the digital environment grows) and the new immunity will solve those problems, too.

Over a year ago the wireless industry created the Center for the Study of Wireless Electromagnetic Compatibility at the University of Oklahoma.

- Working with hearing aid and digital phone manufacturers and the Federal government, the EMC Center is identifying the where, when and why of interaction between digital phones and hearing aids.

Digital Operating Experiences

Commercial digital networks employing GSM technology have been in operation since 1992 and now serve over six million customers worldwide. The first systems were established in Europe, where the issue of interference to hearing aids from digital phones has been debated, thoroughly studied and documented. CTIA requested that the European GSM services providers send information concerning their operating experiences and reports of interference from hearing aid users in their respective markets. The following quotes reflect their operating experience:

DeTeMobil-- GSM service provider 100% government owned, 1.1 million customers, Bonn, Germany:

"To date we have received no reports of interference to hearing aids from our GSM phones."

Orange-- GSM service provider, 200,000 customers, Bristol, England:

"We have subscribers who are hearing aid wearers and are quite pleased with their GSM phones"

Mobile Telephone Services, Telecom Finland--GSM service provider 100% government owned, 130,000 customers, Helsinki, Finland:

"We have received less than 20 reports of interference from our GSM phones. Almost all the reports of interference were received during the first year of commercial operation"

Telenor Mobil--GSM service provider 100% government owned, 100,000 customers, Oslo Norway:

"We have received no specific reports of interference to hearing aids from our GSM phones."

Mannesmann Mobilefunk GmbH-- GSM service provider, 1 million customers, Dusseldorf, Germany:

"The reports of interference to hearing aids caused by GSM phones have been extremely rare."

CENTER FOR THE STUDY OF WIRELESS ELECTROMAGNETIC COMPATIBILITY HEARING AID TESTING PROJECT

The Center for the Study of Wireless Electromagnetic Compatibility at the University of Oklahoma was established in early 1994 with seed money from the wireless industry. One of the primary reasons for creating the EMC Center was the recognition that the parallel growth of affordable digital circuitry and wireless devices would increase the potential for interactions. In order to bring the benefits of all these devices to the public, it was necessary to create a forum where industries could cooperate to develop efficient methods for identification and control of interaction.

The academic independence of the EMC Center assures that every industry and business will have equal access to its services and that government agencies will have an independent resource for information and expertise. The EMC Center is located on the campus of the University of Oklahoma in Norman, Oklahoma. It is managed by the School of Industrial Engineering with a strong research partnership with the School of Electrical Engineering. The University of Oklahoma is a major national research university. Created by the Oklahoma Territorial Legislature in 1890, the University currently has more than 24,000 students and approximately 1,500 full-time faculty members. The University's annual operating budget in 1994 was $487 million.

The goal of the EMC Center is to serve as an independent center dedicated to the investigation of issues related to the electromagnetic compatibility of electronic equipment with wireless devices. The center includes capabilities to provide education to industry and wireless users, a clearinghouse to monitor developments in standards bodies and trade organizations, and a research/test facility for products related to the wireless industry.

In March 1994, the EMC Center developed a proposal to study the interaction between various wireless technologies and hearing aids. The wireless industry accepted the general proposal and in April 1994 presented $100,000 to the University for the EMC Center evaluation of hearing aids and wireless devices.

The EMC Center initiated a literature review of studies performed to date and test protocols used. A planning forum was also held to assist the Center in designing the information collection and test systems necessary to address interaction between hearing instruments and wireless devices.

The goals identified by the forum participants included:

-- Characterize the current state of the art
-- Create a plan for linking the hearing aid and wireless industries for the continuing exchange of information
-- Involve the appropriate standards bodies and regulatory agencies

-- Investigate existing standards and identify trends that may affect interaction
-- Provide hearing aid manufaturers and component producers with information on the electromagnetic charactersitics of wireless devices
-- Develop a joint industry position quantifying interaction and what can be done to resolve it
-- Conduct testing in phases or tiers so that some information can be available quickly
-- Involve the appropriate consumer and related industry groups, *e.g.* audiologists

A draft protocol has been developed based on input from wireless carriers and manufacturers, hearing aid manufacturers and audiologists. The overall purpose of the study is to objectively and subjectively evaluate the interaction so that effective solutions can be identified and implemented. The initial protocol reflects much of the work that has been done internationally on this subject over the past several years.

The protocol design team will meet on July 10 to review and revise the draft protocol. Preliminary testing will be conducted in August and September, with prototype testing in October. Production testing will continue throughout the fall. Results of tiered testing will be reported as they become available and a final report will be issued in early 1996.

Recent Report on Hearing Aid Interference

Recently there has been substantial interest in the area or electromagnetic interference with hearing aids. This issue has been researched extensively in Europe and Australia. A recent study titled *Interference to Hearing Aids by the Digital Mobile Telephone System, Global System for Mobile Communication (GSM) (NAL Report No. 131 May 1995)* was presented by the National Acoustic Laboratories, a division of the Australian Government, to the Bioelectromagnetics Society in Boston. A summary of the study follows.

This report was commissioned to study interference to hearing aids by Global System for Mobile Communications (GSM). Recommendations were made for minimizing interference problems. The goals of the study were:

> *"(a) to assess the degree of interference caused to a wide range of hearing aids by the operation of a GSM mobile telephone; (b) to assess the effectiveness of various treatments and design modifications to hearing aids for reducing GSM interference."*

The report took measurements on several behind-the-ear and in-the-ear hearing aids which had varying degrees of susceptibility to GSM interference. Interference was found to vary considerably between hearing aids. In the models with high immunity compact designs which minimized the length of microphone leads, the study found, "...no interference was detectable even with the hearing aid within a few centimetres from the telephone." Models with low immunity did experience interference.

In addition to the susceptibility, treatments that consisted of shielding, "i.e. coating the hearing aid case with a conductive material or using metal-impregnated cases, and/or the inclusion of shunt capacitors in the circuit", were tested extensively. The results were conclusive, "...that it is possible and practical to design hearing aids to have high immunity" Higher immunity hearing aids ensure that the hearing aid wearer would not experience interference from other users of GSM phones. The report also found that immunity at higher levels, found in certain hearing aid models, actually enables the wearer to use a GSM phone.

The report lays the foundation for the hearing aid manufacturers and users of GSM technology to approach the interference problem:

> *"This investigation has elucidated the potential interference problem, has demonstrated that it is possible to design high immunity hearing aids, has developed a practical measurement system, and has provided data for making realistic recommendations about hearing aid immunity standards and the design and use of mobile telephones for minimizing the problem of interference to hearing aids."*

The Honorable Reed E. Hundt
Chairman Federal Communications Commission
1919 M Street, NW, Room 314
Washington, DC 20554
USA

Corporate R&D

26. March 1995

OML

Subject: Global System for Mobile communications (GSM) as an operating Standard for PCS in the United States of America.

Dear Mr. Chairman:

During the last few weeks, letters and reports regarding the public health and safety of GSM in the United States of America have been circulated between you, United States Senators, Senate Committees and Subcommittees, and Baker and Hostetler prompted in part by misinterpreted and unauthorized comments attributed to me in a report issued by Wireless Communications Council entitled: "The GSM Operating Standard for Personal Communications: A Threat to Hearing Aids and Other Consumer and Medical Electronic Devices". I am writing to you to clarify the situation on electromagnetic compatibility (EMC) between GSM, hearing aids, and other electronic and electrical equipment.

As director of Telelaboratoriet for Telecom Denmark, let me first of all clearly state that GSM telephones, hearing aids, and all other electronic and electrical equipment which meet the European Union EMC directive, 89/336/EEC, can operate simultaneously without interference from each other. This means that hearing aid users can successfully and comfortably use a 2 watt, handhold GSM telephone in conjunction with a hearing aided ear without interference. The only interference my laboratory has ever reported has been between old, inferior quality hearing aids located within three feet's or less of a handhold GSM telephone operating at it's maximum power level of 2 watts. In the existing population of hearing aids, one third had the immunity to be used with a GSM telephone, the rest had such good immunity that the probability for disturbances from other users of GSM telephones was found to be negligible.

In my little country of Denmark, over 250.000 people (4.8 % of the population) are currently using GSM telephones on two competitive, nation-wide networks and not one single complaint has been received by the Danish Telecom Inspector from

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26. March 1995

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hearing aid users, car owners, hospitals, airports, medical equipment suppliers, consumer protection agencies, etc.. I also wish to advice you that it is considered inaccurate for Wireless Communications Council to single out GSM as a potential interferer, as all analogue and digital radiotransmission standards can influence the function of electronic devices including, but not limited to AM, FM, AMPS, CDMA & D-AMPS. It must also be recognized that many digital radio transmitting systems, including D-AMPS, utilize the exact same radio access method as GSM, Time Division Multiple Access (TDMA).

As I have a background not only as a scientific telecommunications research expert, but also as a development manager for the hearing aid industry, I am consistently advising both industries in the development of new modulation technologies and EMC compatibility test methods. A complete copy of my research can be obtained upon request at facsimile number + 45 45 76 99 83.

With copy of letter to:
The Honorable Senator Trent Lott
The Honorable Senator Bob Packwood
Baker & Hostetler, Mr. Guy Vander Jagt

Sincerely,

Ole Mørk Lauridsen
Corporate Director R&D

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