STUDY OF THE POTENTIAL FOR FM RADIO TO BE A UNIVERSAL FEATURE ON CELLULAR HANDSETS

PREPARED FOR THE NAB FASTROAD TECHNOLOGY ADVOCACY PROGRAM

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TABLE OF CONTENTS

LIST OF EXHIBITS

Page

I. EXECUTIVE SUMMARY

A. The study objectives were:

1. **Determine the extent to which U.S. handsets currently have, or can reasonably be expected to have, FM radio receive capability;**

2. **Identify variances between and among handset manufacturers and network operators with respect to the inclusion of FM on handsets;**

3. **Communicate the business logic used by stakeholders and network operators to include, or not include, features on handsets; and**

4. **Assess the extent to which the FCC's Commercial Mobile Alert System (CMAS) initiative might foster expanded FM radio handset penetration.**

B. A review of the current state of the cellular industry concluded:

1. **The data show that, in 2007, only about 8% of U.S. cellular handsets sold (i.e., 12.5M out of 156M) were FM-capable and almost all of these were GSM phones.**

2. **For broadcasters, the current penetration of FM-capable handsets in the U.S. market is not particularly relevant. What is important is that the embedded base of handsets in the U.S. turns over in approximately 19 to 20 months. Assuming FM capability was added to a considerable portion of new shipments of U.S. handsets, within two years there would be substantial penetration of the embedded handset base by FM-capable phones.**

3. **To be successful in the U.S. marketplace, handset manufacturers must conform to the requirements of their customers, the cellular operators. The low level of FM radio functionality in U.S. handsets reflects the current requirements of the cellular operators. *It is almost certain that, if the U.S. cellular operators reversed themselves and required FM receivers in handsets, then the handset suppliers would adjust rapidly and begin to supply such capability as a standard feature.***

4. **As the U.S. operators begin to "open" their networks, then the proportion of FM-capable handsets should increase as manufacturers, especially Nokia and Sony Ericsson, can be expected to move FM penetration in the U.S. towards the level (31% in 2007) in the global handset market. However, for the near-term future (i.e., the next two to three years), broadcasters should assume the "closed" model will predominate.**

5. **If broadcasters are going to persuade operators to increase FM penetration of handsets, then broadcasters will need to be able to explain clearly why FM capability on handsets constitutes an economic benefit to cellular operators.**

This will require broadcasters to understand cellular economics and position FM-on-handsets as being economically positive for operators. In order to be successful, FM-on-handsets must be shown to deliver material cost avoidance (i.e., in implementing the CMAS alert system) and/or material net revenue enhancement to the cellular operators.

6. **The cellular business has *fragile economics* in which revenues are at least balanced, if not exceeded, by cash outflows for operating expenses (including, and especially, new customer acquisition and customer service), handset subsidies, network investment, and spectrum acquisition. Therefore, cellular operators may resist any initiatives by broadcasters that appear to reduce future revenues or increase costs, especially handset subsidies.**

7. **Cellular operators are increasingly dependent on revenue from non-voice services, such as music downloads. Broadcasters and cellular operators have a shared financial interest in music. A critical objection that cellular operators raise to FM-on-handsets is that free OTA music may compete with cellular music services.**

8. **The market share split in the U.S. between GSM and CDMA handsets is relevant to broadcasters because:**

    a. **FM radio on handsets is much more prevalent outside the U.S.;**

    b. **GSM is the predominant world standard for cellular networks, and FM radio on GSM handsets worldwide is relatively common (31% penetration of handsets sold globally in 2007); and**

    c. **FM radio functionality is much more likely on "world" GSM phones shipped to the U.S. than on CDMA phones made for the U.S. market (e.g., in 2007, *for handsets with FM capability,* FM radio was six times more likely on U.S. GSM handsets than on U.S. CDMA handsets).**

9. **The rate of growth for FM capability in the U.S. is expected to *lag* the world market. The reason for this is that, in many developing countries where cellular radio penetration is increasing, bundling multiple functionalities into handsets meets market requirements and is cost effective. However, in the U.S., cellular subscribers continue to carry and use MP3 players or similar devices (e.g., iPods) for music (even playing the devices through their automobile stereo systems), although that means carrying both a phone and an MP3 or similar player.**

10. **Under the current diary-based audience measurement system, listening on handsets is being captured and reported (although the fact that the receive device was a cellular handset would not be captured nor reported). Therefore, the measurement system is in place to capture and report increased listening**

when FM-receive capability expands among the base of cellular handsets.

11. The major reasons cited by cellular operators to not include FM capability in U.S. handsets are as follows:

a. Commercial/Business Issues: (1) no apparent consumer demand exists in the U.S. for FM on handsets; and (2) free over-the-air FM radio broadcasts would compete with operator pay music services; and

b. Form/Technical Issues: Concerns include: (1) adverse impact on battery power; (2) need for a second internal antenna (or use of headset cord as an antenna); and (3) lack of FM coverage in rural areas.

C. CMAS implementation may foster greater cellular network operator interest in including FM-receive functionality in handsets:

1. The CMAS rules reflect the FCC's implementation of a specific Congressional mandate to rely on a broadly-based advisory body, the CMSAAC, to develop CMAS technical requirements. In so doing, the FCC agreed with the recommendation of the CMSAAC and representatives of cellular operators and broadcast interests, that CMAS be "technology neutral," giving operators the flexibility to use the distribution method of their choice, including FM radio.

2. Implementation of CMAS reception capability in handsets *necessarily will require interaction between a cellular operator and the multiple vendors whose handsets the carriers distribute*. Handset vendors may have different cost and development lead time profiles for various solutions. Therefore, a carrier may find that multiple approaches to CMAS reception may be appropriate, at least in the near term.

3. Wireless carriers using the CDMA standard (e.g., Verizon, Sprint) may be the most interested in a cost-avoidance argument for using an FM solution, since "cell broadcast" mechanisms apparently are not defined or deployed in CDMA networks or handsets. Conversely, CDMA handsets have far lower penetration of FM tuners than GSM, so more development and deployment efforts would be required to ensure the broad installed base of FM-capable tuners to make a viable FM-based CMAS solution.

4. Wireless carriers using GSM have at least *some* cell broadcast capabilities installed. The percentage of FM-capable handsets deployed in GSM networks is higher than CDMA networks, although the largest GSM carrier, AT&T states that it that it has not included FM reception in the current handset requirements it has provided to its handset vendors.

5. **Development work will be needed to permit handsets to respond appropriately to messages, including alert tones and vibrations, prioritization of messages (and end-user control over which messages to be alerted to), geo-targeting, etc. This issue was endemic to all solutions and is most problematic for CDMA operators.**

6. **Broadcasters will need to work with providers of FM-RDS services to assure that RDS software is available that will: (a) meet both alert message technical standards and performance requirements; and (b) be compatible with handsets from the range of vendors whose products a particular cellular operator distributes.**

7. **Broadcasters interested in proposing an FM radio solution to meet CMAS requirements have a short-term window to interest cellular operators in placing FM tuners in handsets as an element of the operators' CMAS implementation planning. This window is driven by two related factors: (a) in September 2008, cellular operators must opt in or out of CMAS, such election most likely requiring some advance consideration of technical options for CMAS; and (b) the more operators work with their traditional suppliers, the less likely will consideration be given to FM radio as a CMAS solution.**

8. **The centralized CMAS architecture adopted by the FCC based on CMSAAC's recommendations, is distinct from the federal-state-local collaborative system underlying the current EAS structure. Apparently, an alternative that provides cellular subscribers with access to alert messages by means of EAS reception by FM-equipped wireless handsets (in contrast to having FM-equipped handset reception of CMAS alert messages) was not considered by CMSAAC, most likely because the FCC and CMSAAC were charged by Congress to develop a specific alerting system for commercial mobile service operators.**

II. INTRODUCTION AND OBJECTIVES

Radio broadcasters have an economic interest in increasing the penetration of FM radio receivers in cellular handsets.[1] As penetration increases, radio audience listening time will also go up and that should increase advertising revenues for broadcasters. Other stakeholders, notably cellular network operators (e.g., Verizon, AT&T) and handset manufacturers (e.g., Nokia, LG, Samsung, Motorola, Sony Ericsson), should also benefit due to increased subscriber satisfaction, potential ad revenue sharing with broadcasters, free/reduced cost on-air promotion, purchase of music discovered while listening to FM, and increased subscriber willingness-to-pay for handsets/ service. FM-in-handsets has the potential to be a win-win situation for all the major stakeholders.

Furthermore, in response to a congressional mandate, the FCC is working with cellular operators to establish a Commercial Mobile Alert System (CMAS) that would use cellular networks to transmit emergency alerts to the general public and/or to specific groups (e.g., emergency responders). CMAS constitutes a distinct opportunity for broadcasters to demonstrate that FM radio constitutes a very good, or possibly the best, approach by which cellular operators could participate in the CMAS while minimizing capital expenditures and cellular network congestion.

Given the above context, the National Association of Broadcasters (NAB), via the NAB FASTROAD technology advocacy program, commissioned this study to:

1. Determine the extent to which U.S. handsets currently have, or can reasonably be expected to have, FM radio receive capability;

2. Identify variances between and among handset manufacturers and network operators with respect to the inclusion of FM on handsets;

3. Communicate the business logic used by stakeholders and network operators to include, or not include, features on handsets; and

4. Assess the extent to which the CMAS initiative might foster expanded FM radio handset penetration.

In order to achieve these objectives, we reviewed publicly available documentation, conducted interviews with representatives of stakeholder organizations, and compiled manufacturer data on the current and future FM penetration of handsets.[2] The results of our analyses have been summarized in this report.

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[1] Unless stated otherwise, as used in this report, the terms "cellular," "the cellular industry," and "handsets" refer to the *U.S.* cellular industry.

[2] AM reception was not included, since AM radio broadcasts in a frequency band below that of both FM radio and cellular, necessitates a third antenna, with potentially less signal quality than FM. Consequently, except for a few handsets produced for emerging markets, such as India, handset manufacturers have not included AM reception capability in addition to, or in lieu of, FM.

III. CURRENT BASELINE

The more broadcasters understand about the current state of the cellular telephone business, the more effective broadcasters will be in convincing cellular operators that FM-in-handsets makes good economic sense for both parties. This chapter provides a concise overview of the current state of the U.S. cellular industry with some trend data covering the next few years.

This chapter also clarifies the extent to which FM tuners are present currently in U.S. handsets. The U.S. market is also contrasted with the rest of the world where the FM-tuner-in-handset situation is very different.

A. Overview of the U.S. Cellular Industry

The number of U.S. cellular phone subscribers is estimated at 257 million (Exhibit I) with an overall population penetration rate of 84.5%[3] and a subscription rate of 90%+ for the U.S. population segment between 20 and 49 years of age. In fact, as of year-end 2007, 13.6% of U.S. households are estimated to be "wireless," that is, have no traditional wired phone service.[4]

In 2007, U.S. consumers purchased approximately 156 million handsets,[5] which means that the embedded base of U.S. handsets turns over in less than two years.[6] **Both the absolute size of the handset market and the rapid turnover[7] make cellular handsets an extremely attractive receive platform for broadcasters.**

There are four major U.S. cellular network operators:[8]

a. **AT&T** (70 million subscribers);

b. **Verizon Wireless** (66 million subscribers);

c. **Sprint/Nextel** (45 million subscribers); and

d. **T-Mobile** (29 million subscribers).

In addition, there is a set of primarily regional carriers, of which Alltel Wireless (13 million subscribers) is the largest.

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3 Equal to subscribers divided by population. U.S. population estimated at 304 million based on April 2008 data available from the U.S. Census Bureau. This penetration calculation may overstate actual penetration because of second phones, data-only devices, and other services, such as GM's OnStar.

4 Cellular Telecommunications and Internet Association (CTIA) website, www.ctia.org (April 10, 2008).

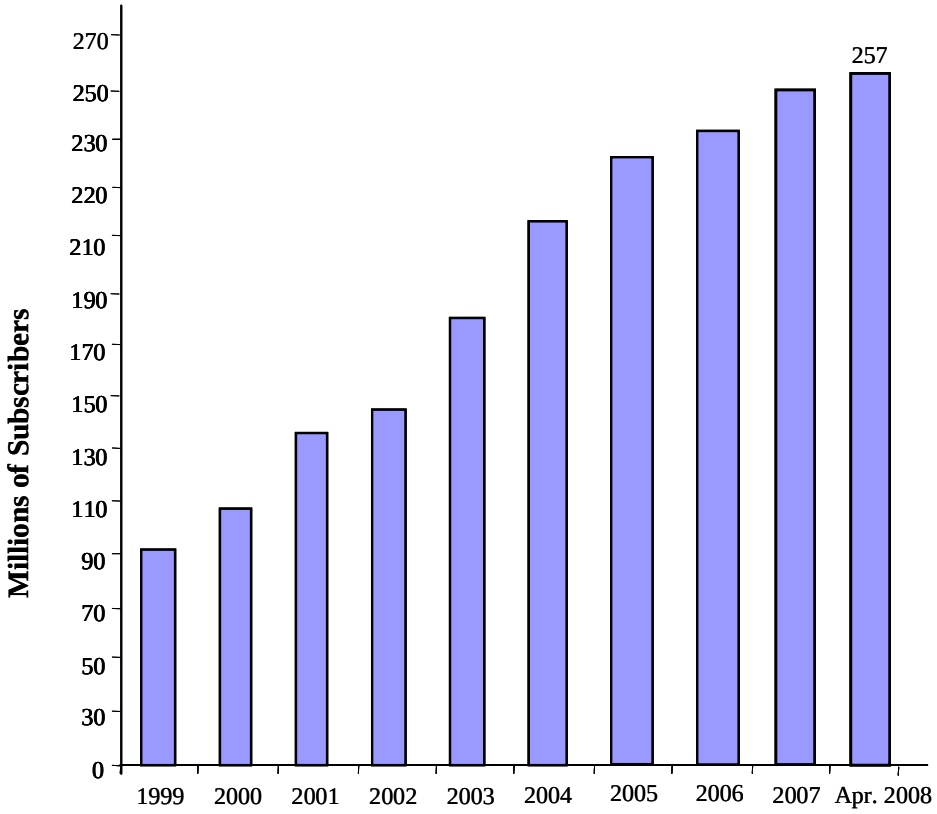
5 Source: iSuppli data prepared for NAB. Handset volume is based on shipments of handsets to the U.S. For purposes of this report, shipments can be considered to be end-user sales since handset inventory levels rarely exceed two weeks. For comparison purposes and also using iSuppli data, the 2007 world market for handsets was 1,150 million. This means that the U.S. handset market constituted only 14% of the 2007 world market.

6 Total subscribers (257M) divided by annual handset sales (156M).

7 Rapid turnover is important because a new handset functionality (e.g., FM radio) may penetrate the embedded base quickly.

8 Subscriber counts based on 2007 Annual Reports or other operator filings/news releases, and are as of year-end 2007.

Exhibit I
U.S. Cellular Subscribers



Note: All figures are end of year except 2008; Net U.S. subscriber add rate (2007) = 1.8M/month
Source: Cellular Telecommunications & Internet Association

The U.S. wireless telephone market is approaching saturation in terms of the number of subscribers.[9] If you remove from the total population, the very young, those with long-term disabling illnesses, the imprisoned, and the badly credit-challenged, there is very little room for growth in terms of subscriber count (i.e., Gross Adds), where there is room for growth in terms of average revenue per subscriber (ARPU). Therefore, network operators are increasingly oriented to growing the monthly spend of existing customers on cellular services, rather than focusing on high cost programs to win subscribers away from other operators.

The cellular industry is competitive. Operators compete on price, network coverage, customer service, and applications/functionality (e.g., voice, data, music, video). The average monthly cellular bill has remained in the $48-$50 range since 2002.[10] *However, the voice component of operator revenue has been decreasing while the non-voice component (primarily data, especially text messages) has been increasing*. For example, Verizon reported that Verizon Wireless experienced a 44% increase in data revenue per

[9] In its 2007 Annual Report (p.30), AT&T described the U.S. wireless market as "maturing" based upon "a slowing growth rate of new wireless users."

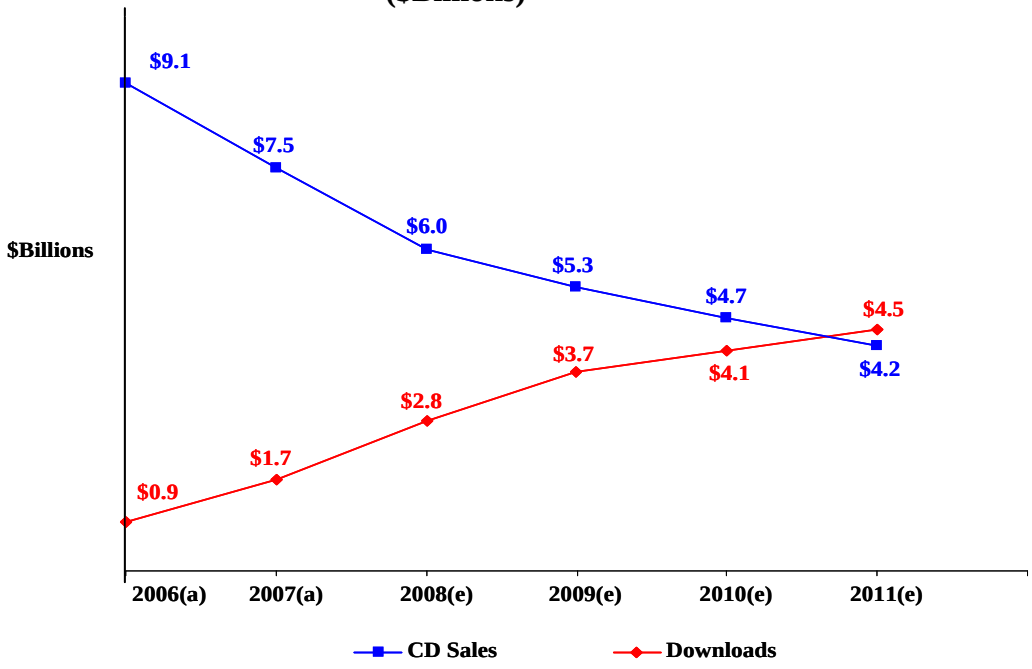
[10] CTIA, 2007 Mid-Year Survey (June 2007). In real economic terms, subscribers are getting more for less.

customer in 2007, driven by increased use of messaging and other data services.[11] Similarly, AT&T reported a 46.9% increase in 2007 in data revenue per wireless customer, and a 4.1% decrease in voice revenue per subscriber.[12]

Given the decline of voice revenues, the cellular operators are emphasizing non-voice services as the engines of future growth. Consequently, cellular operators are competing to increase the number and profitability of non-voice revenue-generating services, such as music downloads and satellite radio subscriptions.

Broadcasters and cellular operators share an economic interest in music. Radio broadcasters have begun to emphasize the "the future is wireless,"[13] meaning that the radio reception will be increasingly done and measured on mobile devices such as MP3 players, iPods, laptops, and *cellular phones*, rather than simply on traditional in-home and automobile radios. *Substantially all of the listening to be done on these non-traditional devices is expected to be music.*[14]

Exhibit II
Music CD vs. Download Markets
($Billions)



Source: Forrester, "The End of the Music Industry As We Know It" (February 2008), p. 10.

[11] Verizon Communications, Inc., Form 10-K for the fiscal year ended December 31, 2007 (p. 57).

[12] AT&T, Form 10-K for the fiscal year ended December 31, 2007 (p. 11).

[13] For example, see the presentation by Jeff Haley, President, Radio Advertising Bureau (RAB), at the Bear Stearns Advertising and Marketing Virtual Summit (January 18, 2008).

[14] This is consistent with the general usage pattern for radio, where only 10.7% of the national radio audience tunes to news/talk/information stations. Furthermore, news/talk/information radio attracts a demographic that is less desirable both to radio advertisers and cellular operators (i.e., 77% of news/talk/information listeners are 45 years of age or older). Source: Arbitron's *Radio Today: 2008 Edition*, p. 5, 17.

Cellular operators plan to capture a material portion of the wireless download market with handsets being able to store and play downloaded music.[15] The music download market is projected to exceed the CD market by 2011 (Exhibit II). A critical objection that the cellular network operators raise to FM-on-handsets is the free over-the-air music broadcasts compete with the operators' need to maximize music revenues/profits from subscriber downloads. If there is to be an increase of FM-on-handsets, then broadcasters must meet this objection.[16]

Furthermore, it is important to understand that cellular operators in the U.S. have deployed two incompatible cellular telephone technologies: CDMA (Verizon Wireless[17] and Sprint) and GSM (AT&T and T-Mobile). Phones that use one of these two technologies cannot work on a network using the other technology.[18] In general, cellular network operators will not permit consumers to use their phones even when switching between two carriers that use the same network technology (e.g., from Sprint to Verizon or vice versa). The operators require consumers to purchase new phones that are authorized for use on their network. The carriers justify these restrictions because they subsidize the price of handsets, a practice that began in the late 1980s and early 1990s, when unsubsidized handset prices were high and constituted a barrier to a mass market for cellular service.

Cellular network operators remain critical to broadcaster success because under the current closed model, cellular operators subsidize the handsets that are sold to subscribers. In very simple terms, if a handset manufacturer prices a handset at $400 that is sold to a subscriber by a network operator at $60 (with a commitment to a 24-month service contract), the $340 difference is a subsidy by the operator that must be amortized (i.e., recovered) over the subscriber's life.[19] The total amount of the handset subsidy is not trivial. For example, for 2007, Sprint/Nextel reported an "equipment net subsidy" (i.e., cost of equipment sold in excess of payments received) of $2.4 billion.[20]

The magnitude and structure of their handset subsides give U.S. cellular operators unique control over the functionality and features of handsets.[21] Generally, in the rest of the world, consumers first select the handset and then pick a network operator. In the U.S., the situation if reversed -- first the operator is selected and then the consumer selects a handset from among those authorized by the operator for use on its network. **For broadcasters, this means that, at least in the near term, the concurrence of the**

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15 For example, in 2008, AT&T has forecasted $40-$50 million in revenue from music download services.

16 Note that the potential conflict situation between broadcasters and network operators would be mitigated in an "open" network model (e.g., as in Europe) where handset manufacturers and consumers drive handset features to a much greater extent than in the U.S. where cellular operators control handset functionality.

17 Verizon has announced that it will evolve from CDMA to GSM by adopting long-term evolution (LTE) technology in its fourth generation mobile broadband network (Verizon 10-K, December 31, 2007, p.8).

18 The exception is if a handset is a dual mode CDMA/GSM phone. Such dual mode phones are relatively rare.

19 In some cases, through cash rebates and offers of free accessories, network operators effectively pay new subscribers to sign as customers rather than receive any payment when signing a new customer.

20 Sprint, Form 10-K, for the fiscal year ended December 31, 2007 (p. 46).

21 In the U.S., both cellular subscribers *and* the handset manufacturers have been conditioned to handset subsidies. Mass market subscribers resist paying more than $100 for a handset, regardless of functionality. Manufacturers are risk avoiders that require volume purchase commitments from U.S. cellular operators before manufacturing new handset models.

cellular network operators is a prerequisite to the expansion of FM receive capability on handsets.[22]

Approximately three to five years ago, cellular operators did allow FM-receive functionality on a subset of handsets. This occurred at a point in time when operators were attempting to determine which combination of features and functions attracted the most subscribers.[23] FM-equipped phones did not sell particularly well.[24] Therefore, operators concluded that there was no material demand for FM functionality on handsets and that consumers will not pay extra for FM-equipped handsets. In addition, operators report that, in addition to lack of take up by consumers, problems associated with FM-equipped handsets included: (1) the requirement for a separate antenna (often the cord for the headset used with FM); (2) concern with the drain on the battery from playing the FM radio; and (3) lack of, or poor reception in, certain topographies and rural areas. This was confirmed by AT&T in one of its reply comments in the CMAS proceeding:[25]

> *Significant technical constraints also limit the utility of FM radio as an emergency alerting solution. The large FM antennas needed to receive alerts do not fit into individual handsets. Mobile users would need to carry or wear an additional device to receive FM radio alerts. Currently, cell phone users with FM radios address this problem by wearing headsets when using the FM radio – the headset cord serves as the FM antenna. But this is not a practical, everyday solution for most mobile device users. Additionally, FM radio alerting methods would significantly drain the battery life of mobile devices. …And FM radio solutions would have limited value for mobile users located in rural areas. FM stations frequently do not provide coverage in such areas.*

Similarly, Verizon argued that a decision to include FM radio chips in handsets also would need to be based on a better understanding of "the effect such capabilities would have on the size of current devices."[26]

The cellular handset market has three tiers: (a) the high end top tier in which there is little or no operator subsidy for handsets (approximate price point = $500 and above for a handset); (b) a middle tier with subsidy and price points at or above $150; and (c) a "low end, basic" tier. Today, network operators have less control over, and interest in, the functionality in the top tier phones, which is traditionally where handset manufacturers

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[22] This means that the handset manufacturers are relatively less important in the U.S. than in the rest of the world. In general, worldwide (except the U.S.) manufacturers include functions and features in handsets without prior approval/permission of network operators. The only real restriction is that the handsets must be compliant with network interface standards.

[23] Remember that the U.S. handsets are both subsidized and "locked" to a given network operator. To the extent specific handset feature/function combinations sold better than others, the result was more subscribers and lower churn so the handset subsidy was money well spent. On the other hand, feature/function combinations that did not sell wasted subsidies that would be better applied elsewhere.

[24] Based on interviews with network operators.

[25] AT&T, *Reply Comments,* PS Docket 07-287 (February 19, 2008), p. 9.

[26] Verizon Wireless, *Reply Comments*, PS Docket 07-287 (February 19, 2008), pp. 3-4.

have introduced functionality (e.g., cameras) that the operators will not subsidize initially.[27]

The U.S. "closed" cellular network model is becoming *more* "open."[28] There are three reasons, all interrelated, that are pushing existing network operators toward a more open model. These are: (a) the Federal Communications Commission required an open model for the key "C block" in the Q1 2008 spectrum auctions;[29] (b) Google has announced[30] the "Android," a Google-designed open model handset; and (c) Verizon has announced that no later than December 2008, it will "open" its wireless network by publishing technical interface standards and allow subscribers to use wireless devices not provided by Verizon so long as those devices meet the published standards.[31] **The movement towards a more open cellular network model favors broadcasters in that it decreases the control of the cellular operators over handset features and functions.[32] However, the move to a more open network model will be an *evolution* over time. Therefore, at least over the next two to three years, the "closed" model will remain in force.**

Because of the subsidy structure, network operators generally have no interest in subsidizing handset capabilities that do not generate revenue for the operators.[33] Therefore, in order to have FM receive capabilities built into cellular handsets, local broadcasters must be prepared to go to the operators with a package that demonstrates how operators can benefit financially from including FM receive capability on handsets. This could include "tagging" of songs for later purchase from a cellular operator's music download service using RDS' new Radiotext+ capability.[34]

Cellular operators' financial concern is not just the handset price. There is also the issue that cellular telephone users may substitute time listening to free FM broadcasts that would otherwise be spent on activities (e.g., text messaging) that generate revenue for the cellular operators.

Finally, it is critically important that broadcasters understand the economics of the operators' wireless businesses. While these businesses are huge, they are extremely

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27 Once the high-paying early adopters are exhausted, the manufacturers tend to recommend lowering the price point to subscribers while requesting a subsidy from the cellular operators. Knowing this pattern, operators are resisting handset vendor initiatives even at the high end.

28 "Closed" is used in the sense that the cellular operators control the functionality of handsets that are authorized for use on their networks. An "open" network model would be one in which handset functionality is driven by consumer demand and handset device manufacturers responding to that demand, as well as testing new functionalities in the market. In the open model, handset subsidies by network operators are reduced substantially over their current levels or eliminated entirely.

29 Verizon was the winner of multiple regional spectrum awards within C block.

30 *The New York Times*, "For Google, Advertising and Phones Go Together" (October 8, 2007). Yahoo followed suit in January 2008, announcing it too will support an open mobile network.

31 *Wall Street Journal*, "Verizon to Open Cell Network to Others' Phones" (November 28, 2007), p. B1.

32 An analysis of the U.S. market for cellular telephone handsets concluded that "advanced functionality" was the primary driver of handset prices. Therefore, in an "open" network situation, it would seem that handset manufacturers could position FM radio receive capability as a new "function" and, therefore, sell such phones at a premium. See "Mapping Your Competitive Position" by Richard D'Aveni, *Harvard Business Review* (November 2007).

33 Interviews with operator and handset manufacturer representatives.

34 See NAB, *Radio TechCheck* (October 2, 2006).

competitive, absorb substantial annual capital investment, and are subject to the vagaries of mass consumer markets. In 2007, Verizon Wireless earned $3.8B (8.7%) after tax on revenues of $43.9B (including $5.9B in equipment sales, most of which were for handsets).[35] However, in 2007, Verizon invested $6.5B in capital in its wireless network and then spent $9.4B to acquire more spectrum[36] in the 2008 700 MHz spectrum auction. **The bottom line is that the cellular business has fragile economics in which large cash inflows are at least balanced, if not exceeded, by cash outflows for operating expenses, handset subsidies, network investment, and spectrum acquisitions. To have any success with the operators, broadcasters must at least position FM-on-handsets as a major cost avoidance solution,[37] if not an overall revenue enhancing opportunity.**

B. Handset Market Overview

1. CDMA vs. GSM

Cell phone subscribers represent a large and growing potential audience for broadcast FM radio. Consequently, widespread inclusion of FM receivers in cellular handsets could create a new category of mobile (non-auto) listeners.

However, the characteristics of the U.S. handset market places the leading cellular carriers in control of the rate of FM-capable handset penetration. The reason for the central role of cellular carriers in the U.S. is two-fold.

First, as discussed above, unlike the rest of the world, in the U.S., the distribution of handsets is largely controlled by the carriers themselves, who offer subsidized handsets in return for agreement to one- or two-year contracts. In contrast, frequently in Europe and Asia, handsets are sold to consumers on an unsubsidized basis separately from service contracts.

Second, the world's predominant cellular technology is based on the "GSM" standard, developed by European cellular operators. However, the U.S. is divided between the Code Division Multiple Access (CDMA) standard (developed by the U.S. technology firm Qualcomm) and the Global System for Mobile Communications (GSM) standard. While CDMA is used by new entrants in several countries, other than in the U.S., it is generally used by major, incumbent carriers only in Canada and Korea.[38] Since few handsets are equipped to operate on both GSM- and CDMA-based networks, U.S. consumers are largely confined to one handset technology or the other.

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[35] Verizon Communications, Inc., Form 10-K (December 31, 2007), pp.39-40. For comparison purposes, total broadcast radio *industry* revenue is about $20B.

[36] Verizon, Investor Conference Call on 700 MHz Auction Results (April 4, 2008).

[37] Cost avoidance is relevant to the CMAS situation that is discussed in the next chapter of this report.

[38] As of the first quarter of 2007, cell phones based on the GSM family of standards were used by about 85 percent of worldwide subscribers, while CDMA-standard handsets were used by about 13 percent of worldwide subscribers. Source: The GSM Association (based on data from Wireless Intelligence).

The non-U.S. practice of selling handsets and services separately is reinforced by a technological characteristic of GSM: the handset-carrier interface is provided by a SIM (Subscriber Interface Module) card and it is the SIM card, not the handset, that is carrier-specific. While it is possible for handsets to be "locked" to accept only SIM cards from a specified carrier, manufacturers (and their distributors) usually sell handsets that are "unlocked" in that they will accept SIM cards from any wireless carrier. For example, Sony offers unlocked Sony-Ericsson handsets with the promise that:[39]

> *With a Sony Ericsson unlocked phone, you're in control.*
>
> *Getting unlocked means getting a new cell phone with the freedom to upgrade or change phones whenever you want. Sony Ericsson unlocked cell phones are based on the GSM standard and have a removable SIM card that makes it easy to transfer contacts and service subscriptions from one compatible cell phone to another via your SIM card. … GSM cell phones allow you to upgrade to another compatible unlocked phone before the end of your contract, without having to extend your service agreement. With Sony Ericsson unlocked GSM cell phones, you decide when it's time to step it up.*

In contrast, CDMA phones do not have a separable interface card. As a consequence, handsets are sold (either by a carrier, its agents, or the manufacturer) "locked" to the services of a particular carrier. In turn, the phones are, in effect, "locked" to the handset strategy of that carrier.

The market share split in the U.S. between GSM and CDMA handsets is relevant to broadcasters because:

a. FM radio on handsets is much more prevalent outside the U.S.;

b. GSM is the predominant world standard for cellular networks, and FM radio on GSM handsets worldwide is relatively common (31% penetration of handsets sold globally in 2007);[40] and

c. FM radio functionality is much more likely on "world" GSM phones shipped to the U.S. than on CDMA phones made for the U.S. market (e.g., in 2007, *for handsets with FM capability,* FM radio was six times more likely on U.S. GSM handsets than on U.S. CDMA handsets).[41]

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[39] http://www.sonystyle.com/webapp/wcs/stores/servlet/ContentDisplayView?hideHeaderFooter=false&storeId=10151&catalogId=10551&langId=-1&cmsId=sony_ericsson_unlocked_phones

[40] 354M FM-capable handsets out of a world total of 1,150M handsets. Source: iSuppli data prepared for NAB.

[41] 10.8 U.S. GSM handsets ÷ 1.7 U.S. CDMA handsets. Source: iSuppli data prepared for NAB.

2. FM-Capable Handsets by Manufacturer

As set out in greater detail below, each of the major cell phone providers—Nokia, Motorola, Samsung, LG, and Sony Ericsson—appear to place a differing emphasis on FM-capable handsets in their global product line-up:

a. All Sony Ericsson handsets announced since the beginning of 2008 have FM reception capabilities (and all are GSM phones);

b. A substantial portion of Nokia handsets, both low-end and their most expensive multimedia devices, are FM-capable[42]; and

c. The three major U.S. handset suppliers, Motorola, Samsung, and LG, currently offer substantially fewer FM-equipped handsets.

These differences affect the penetration of FM-equipped handsets in the U.S., since the market shares of the most FM-focused players, Nokia and Sony Ericsson, are significantly less in the U.S. than globally (Exhibit III). Indeed, Sony Ericsson was not one of the top five manufacturers in terms of U.S. sales in 2007. That honor went to Research in Motion (RIM), maker of the non-FM-equipped Blackberry line of smart phones. The significance is that the three dominant handset suppliers to the U.S. market (combined 69% share) have not emphasized FM functionality in handsets, either globally or within the U.S.

Further, FM-capable handsets do not always include RDS capability, and its presence or absence may not be clearly defined in product literature.[43] In this context, AT&T has publicly stated that, although about 10 percent of the handsets it distributes have FM reception capability, *none* have RDS.[44] Finally, a search of product literature has not revealed any instances in which FM antennas are built into the handset; rather manufacturers specify that a stereo headset should be used, with the cord acting as the antenna.[45]

3. U.S. FM-Equipped Handsets by Manufacturer

Nokia. Nokia provides a broad range of FM-capable cell phones (almost all of which are GSM). At the top-end is Nokia's N95 multimedia handset, sold without cellular operator subsidy on Nokia's U.S. web store for $779 and soon to be replaced by the N96, with both FM and RDS capabilities.[46] At the other end of the spectrum, T-Mobile (a GSM operator) is offering the inexpensive FM-capable

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42 Nokia has largely withdrawn from the CDMA marketplace in the U.S., at least for the time being.

43 For example, the data sheet for the Nokia N96 specifies "stereo FM radio with RDS," while the data sheet for the N78 simply specifies "stereo FM radio."

44 AT&T, *Reply Comments*, PS Docket 07-287 (February 19, 2008), p. 9.

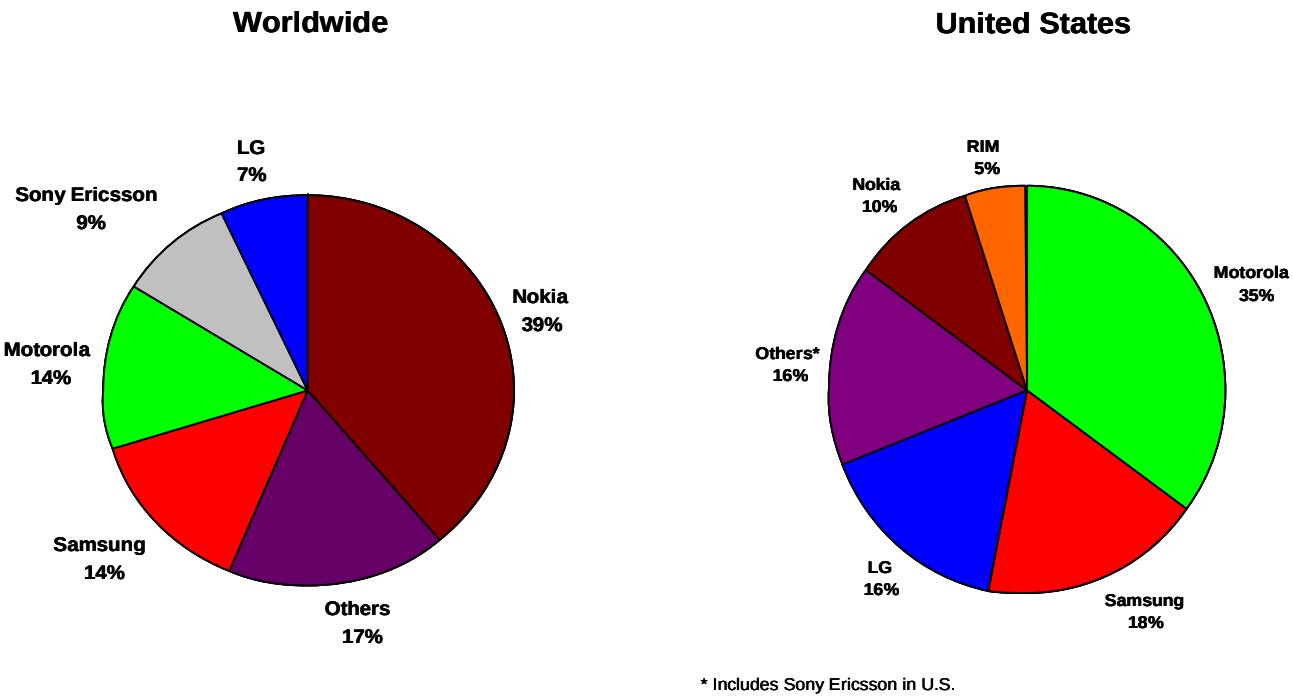
45 Sony Ericsson, "Sony Ericsson tunes-in to emerging markets and radio fans" (January 24, 2008) (Included headset: "stereo portable handsfree with built in FM/AM antenna"); Nokia, *User Manual*, N95, (2007), p. 38 ("The FM radio depends on an antenna other than the wireless device antenna. A compatible headset or enhancement needs to be attached to the device for the FM radio to function properly.")

46 Nokia, "Nokia N96 Data Sheet" (2008)

Nokia 6103 for "Free" with a service contract.[47]

According to Nokia, the company makes 41 phones available to the U.S. market, with Nokia identifying 25 (61%) of them as FM-capable.[48] In contrast, Nokia distributes a greater variety of FM-quipped phones elsewhere. For example, in the UK, Nokia offers 67 models, 47 (70%) of which have FM capability.[49] In India, Nokia offers 53 models, with 37 (70%) of them FM equipped. In 2007, Nokia FM phones constituted almost 60% of all U.S. FM handset sales even though Nokia's U.S. handset market share is only ten percent.[50]

Exhibit III
Market Shares of Handset Manufacturers
(2007)



Source: Strategy Analytics, reprinted in Wall Street Journal, p. B1 (March 27, 2008)

Unfortunately, the direction of Nokia's U.S. product offerings is unclear in terms of the future percentage of its models that will be FM equipped. Nokia recently stated that it is becoming more carrier-focused in the U.S. (i.e., more willing to produce handsets tailored to the U.S. market as determined by the major network operators):[51]

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47 www.t-mobile.com/shop/phones (visited March 5, 2008); "free" means that the customer does not pay for the phone, while the network operator pays 100% of the cost of the phone to the manufacturer.

48 www.nokiausa.com/A4409001 (visited March 30, 2008).

49 www.nokia.co.uk/A4221001 (visited March 30, 2008).

50 Source: iSuppli data prepared for NAB.

51 "Nokia Moves Subtly to Regain U.S. Share," *The Wall Street Journal* (March 27, 2008), p. B1.

> *A major hurdle for Nokia in the U.S. is that about half the handsets sold in the country use a wireless standard that is not broadly used elsewhere [CDMA]. Nokia, accustomed to Europe and Asia, where customers often can also buy phones at independent retailers, typically has not gone to such great lengths to woo the U.S. service providers, who sell phones as part of a package with a contract.*
>
> *[Nokia's North American head, Mark] Louison said he is trying to convince the big U.S. carriers that Nokia has a new, more accommodating attitude. "Until we really start delivering in that concrete way, they'll remain skeptical," he said. To help, Nokia has assigned its U.S. employees to teams, each focused on a major carrier. It has moved teams of its salespeople to buildings next to each of the major U.S. carriers that sell its phones. Nokia had based many of its employees in Dallas. It recently opened close to the New Jersey headquarters of Verizon Wireless, a joint venture of Verizon Communications Inc. and Vodafone Group PLC. Nokia sales representatives have also moved into offices next door to AT&T's wireless headquarters in Atlanta. Previously, "there was really no opportunity for them to weigh in early and make design decisions on products," says Ian Laing, Vice President and General Manager of the AT&T account at Nokia. …*
>
> *To involve the carrier early in the design process, Nokia now regularly invites AT&T representatives to its research-and-design center in San Diego to discuss trends in phone design. The two companies are scheduled to launch several phones in the next six to nine months, Mr. Laing said. An AT&T spokesman said Nokia, along with other handset makers, has become "much more collaborative."*

To the extent that network operators do not specify FM as a required functionality, this close collaboration (i.e., Nokia and the operators) may have significant—and adverse—implications for inclusion of FM capabilities in Nokia phones sold in the U.S. In a recent FCC filing, AT&T stated that, although some (fewer than 10 percent) of AT&T-distributed handsets currently have FM capabilities, "such capability *is not included in future handsets* that AT&T, with its vendors, is already developing for future sale in the U.S. market."[52] Similarly, Nokia is apparently developing a separate CDMA product line for Verizon, using an Asian manufacturing subcontractor, an apparently rare step for Nokia, and indicating that the feature set for CDMA phones may be different than for its generally FM-capable GSM phones.[53]

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[52] *Reply Comments of AT&T, Inc.*, PS Docket No. 07-287 (February 18, 2008), p. 9 (emphasis added).

[53] "Nokia Pushes to Regain U.S. Sales in Spite of Apple and Google," *New York Times* (December 10, 2007).

Sony Ericsson. Sony Ericsson is unique in that most, if not all, of its handsets introduced in 2008 have FM reception capability, many with RDS. The phones with FM capabilities include its high-end Xperia line,[54] Sony's signature Walkman music phone,[55] and Sony's Cybershot camera phones,[56] as well as phones for emerging markets, such as India, where both AM and FM capabilities may be included.[57] However, Sony Ericsson phones (all GSM) have only a marginal share of the U.S. handset market.

In the U.S., Sony Ericsson's phones are sold online. At present, ten phones are offered as unlocked GSM handsets, with eight having FM reception capabilities. The most inexpensive FM-equipped GSM handset is a $139 Walkman.

LG, Samsung, and Motorola (the three largest handset suppliers to the U.S. market). All three manufacturers produce CDMA phones (almost universally without FM capability) and have some GSM phones equipped for FM-reception but do not emphasize them:

a. LG's 2007 global handset line-up[58] lists 42 phones but only one, a GSM phone for the European market, appears to have FM reception capabilities.[59]

b. Samsung lists a "Black-Jack" phone with FM reception that is available through AT&T.[60] However—and perhaps consistent with AT&T's no-FM product specifications—the replacement Black-Jack II through AT&T does *not* have an FM receiver.[61]

c. Motorola's GSM W375, sold through AT&T, has FM capability,[62] while the very similar CDMA W385, distributed through Verizon, does not.

However, it should be noted that to be successful in the U.S. marketplace, handset manufacturers must conform to the requirements of their customers, the cellular operators. Therefore, it can be inferred that the lack of FM radio

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54 Sony Ericsson, "Sony Ericsson Marks the Launch of Its New Brand XPERIA, with the Unveiling of the XPERIA X1 (Press Release, February 10, 2008).

55 Sony Ericsson, "Truly Global Walkman Phone from Sony Ericsson Lets You Share the Passion," (Press Release, January 7, 2008); "Sony Ericsson Puts Music First in the W980 Walkman Phone to Deliver a Clear Audio Experience" (Press Release, February 10, 2008).

56 Sony Ericsson, "Sony Ericsson Strengthens Cyber-Shot Phone Range with Two Models that take Photos Further" (Press Release, February 10, 2008).

57 Sony Ericsson, "Sony Ericsson Tunes-In to Emerging Markets and Radio Fans," "Sony Ericsson Focuses on the Essentials with Two New Models for Distinct Audiences" (Press Releases, January 24, 2008).

58 LG, Livin' LG, Mobile Phone Product Line-up Special Edition (2007).

59 Compared to eight CDMA and GSM phones with mobile TV reception.

60 See www.samsung.com/us/consumer (visited March 9, 2008).

61 A review of the user manual indicates that the Black-Jack has subscription XM, not FM capability. *It is not uncommon that handsets listed for search purposes as having FM radio capability turn out actually to be able to receive XM satellite radio not terrestrial FM radio.*

62 www.motorola.com/consumer (visited March 30, 2008).

functionality in U.S. handsets provided by Motorola, Samsung, and LG reflects the lack of a requirement by operators for FM-capable handsets. *If the U.S. cellular operators reversed themselves and required FM receivers in handsets, then it is almost certain that the handset suppliers would adjust rapidly and begin to supply such capability as a standard feature.*

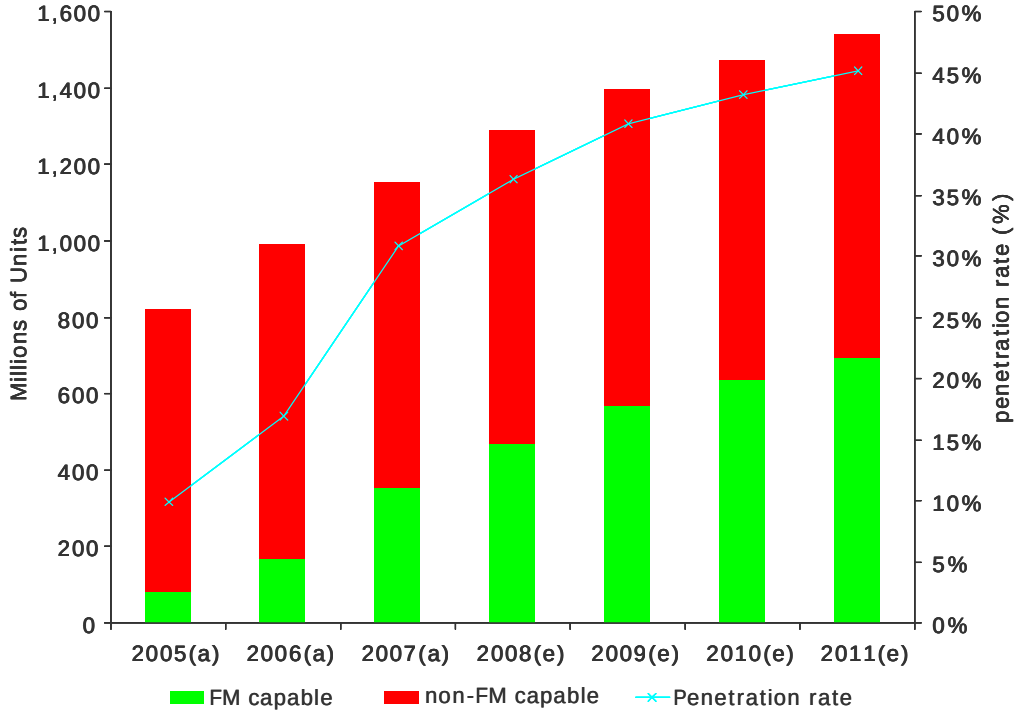
C. FM Radio Functionality in Handsets

The data provided in this section was supplied under contract by iSuppli, a research organization that provides current wireless market information and trend analyses to network companies and equipment/handset manufacturers. iSuppli is in regular contact with cellular operators and handset manufacturers and prepares market forecasts for 34 handset original equipment manufacturers (OEMs). In addition, iSuppli surveys a sample of U.S. consumers that have purchased handsets. The data compiled by iSuppli for NAB drew both on manufacturer contacts/forecasts and the U.S. consumer handset purchaser surveys.

1. The Global Market

At the global level, the growth of FM capability in handsets is very robust. As shown on Exhibits IV and V, FM penetration globally is 31% (2007) and expected to increase to 45% by 2011.

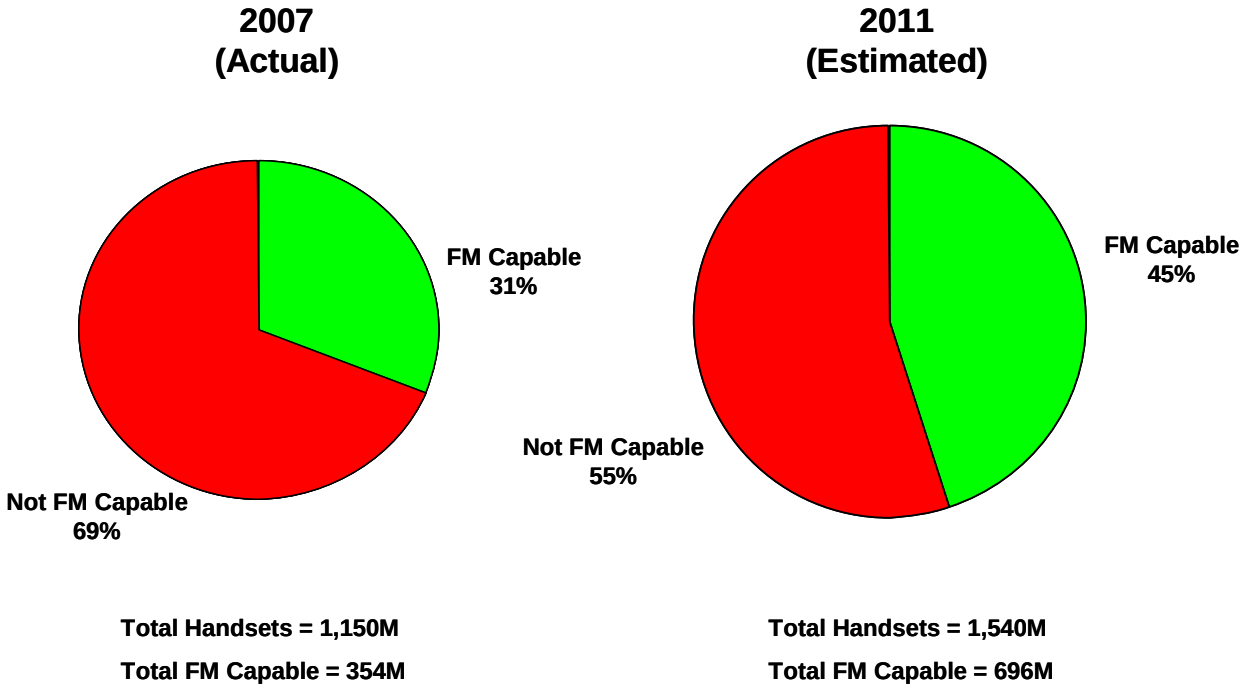
Exhibit IV
Global FM-capable Handset Market
(2005-2011)



Source: iSuppli data prepared for NAB. All information and intellectual property contained in this Exhibit is the sole property of iSuppli Corporation.

The compounded annual growth rate (CAGR) for all handsets (2008-2011) on the global market is projected to be only 7.6%, while the CAGR for FM-capable handsets is forecasted to be 18.4%, about 2.4 times as fast.[63] As shown on Exhibit IV, FM-capable penetration of new handset sales was only about 10% as of 2005. A primary driver of FM-capable growth globally is the expansion of cellular service in less developed countries. In less developed countries, cellular subscribers use their handsets for news and entertainment, as well as communications. Therefore, bundling multiple functions (including FM radio) into handsets meets market requirements and is cost effective in the less developed countries where cellular service is increasing rapidly.

Exhibit V
Global Penetration of FM Receive Capability
(2007 vs. 2011)



Source: iSuppli data prepared for NAB. All information and intellectual property contained in this Exhibit is the sole property of iSuppli Corporation.

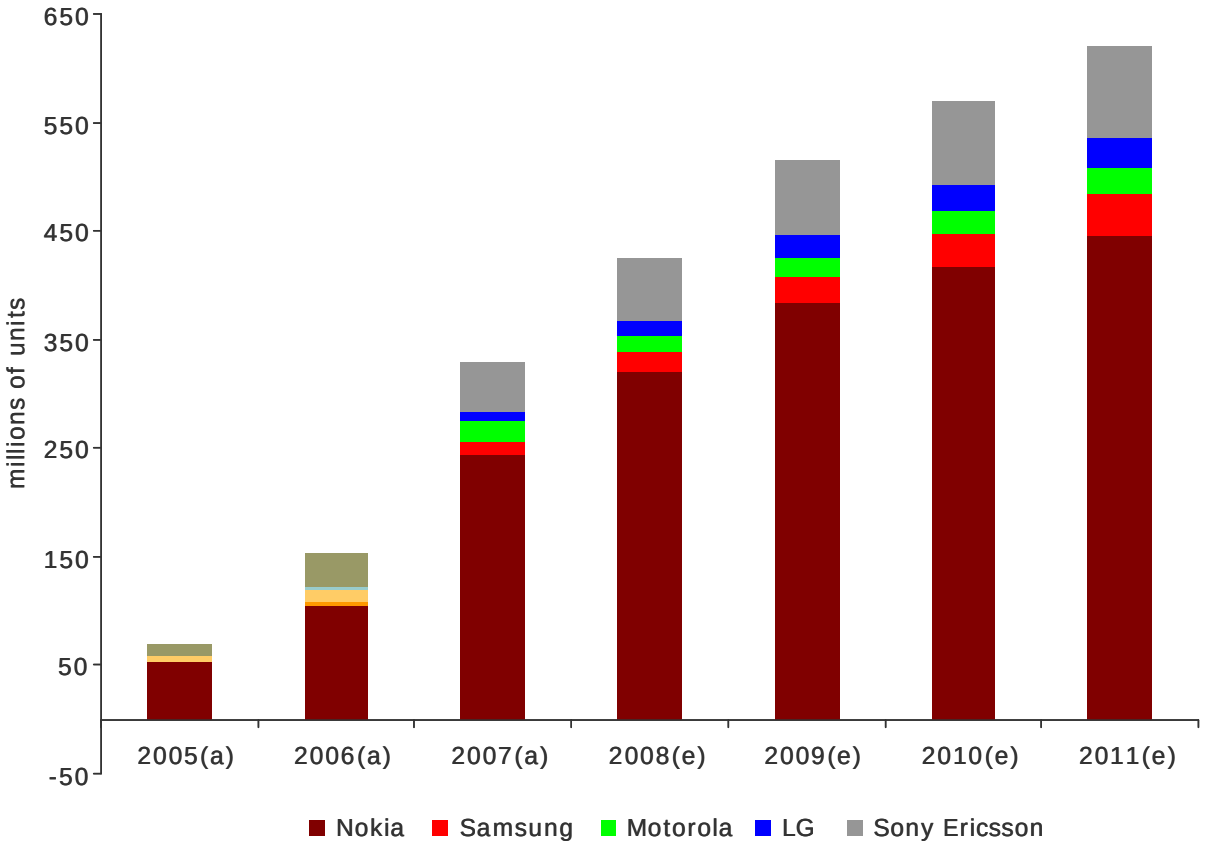
With respect to market share of FM-capable handsets, the top five handset manufacturers[64] are expected to continue to be the dominant providers, supplying approximately 90% of the global demand for FM-capable handsets. The major suppliers of such handsets are Nokia and Sony Ericsson (75%-80% combined share). However, both LG and Samsung are expected to grow their share of FM-capable handsets (Exhibit VI). **It should be noted again that the manufacturers with the largest share of the U.S. cellular handset market**

63 Projections reflect the best information available at the time the projection is made. Subsequent potential events, such as the adoption of FM-in-handsets as the basis for national alert systems are not factored into the projections, but constitute potential up-side to the current baseline projections.

64 Nokia, LG, Motorola, Samsung, and Sony Ericsson.

(Samsung, LG, Motorola) are not currently major global players with respect to FM-capable handsets.

Exhibit VI
Global FM-capable Handset Market by Top Five Manufacturers
(2005-2011)



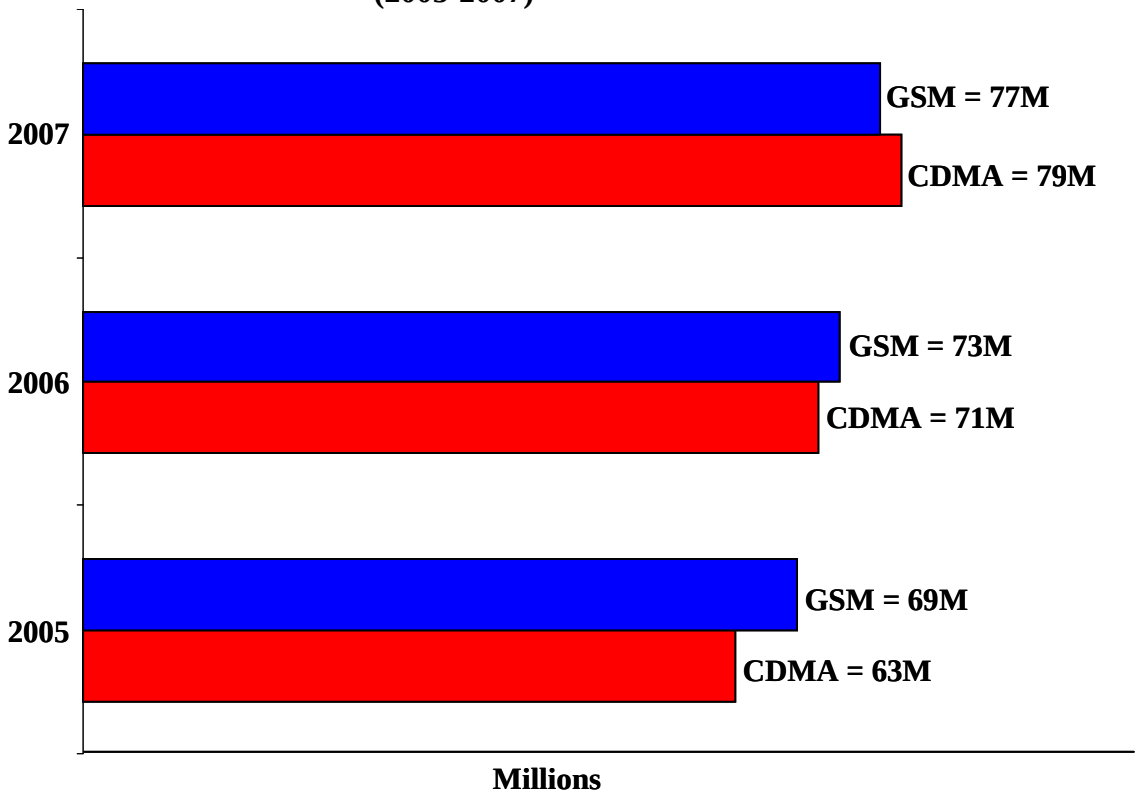
Source: iSuppli data prepared for NAB. All information and intellectual property contained in this Exhibit is the sole property of iSuppli Corporation.

2. The U.S. Market

As discussed previously, the overall U.S. handset market is divided almost evenly between the CDMA and the GSM standards. This is relevant in that currently (and for the foreseeable future), FM capability is much more prevalent in GSM than in CDMA handsets. Contributing factors for GSM's predominance in FM capability include: (a) closer integration of FM capability in the GSM chip sets versus more separation in Qualcomm's proprietary CDMA chips; (b) the large global GSM market makes it easier to build FM capability into 'world phones' that work anywhere versus CDMA phones that work in very few countries; and (c) the leading providers of FM-capable handsets globally are Nokia and Sony Ericsson, but Nokia is only #4 in the U.S. handset market [but #1 globally with a 39% share] while Sony Ericsson is not in the top five in the U.S. handset market.

In 2007, according to the iSuppli analysis done for NAB, 156 million handsets were shipped to the U.S.[65] The 156 million was evenly divided between CDMA (79 million) and non-CDMA (77 million) handsets (Exhibit VII). Of the 156 million, approximately 12.5 million (8%) of the handsets were FM-capable.[66] **Because iSuppli tracks chip set-level functionality in phones, FM-capable handset shipments constitute the maximum number of handsets that can receive FM broadcasts. If network operators do not enable the FM function, then in 2007, those that were FM-capable-but-not-FM-enabled were only a subset of the 12.5 million.**

Exhibit VII
U.S. Handset Volumes: CDMA vs. GSM
(2005-2007)



Source: iSuppli data prepared for NAB. All information and intellectual property contained in this Exhibit is the sole property of iSuppli Corporation.

The U.S. penetration of FM capability is substantially below that of the world market. As shown on Exhibit IX, in 2007, world market penetration was 31% versus only 8% for the U.S. (Exhibit VIII).[67]

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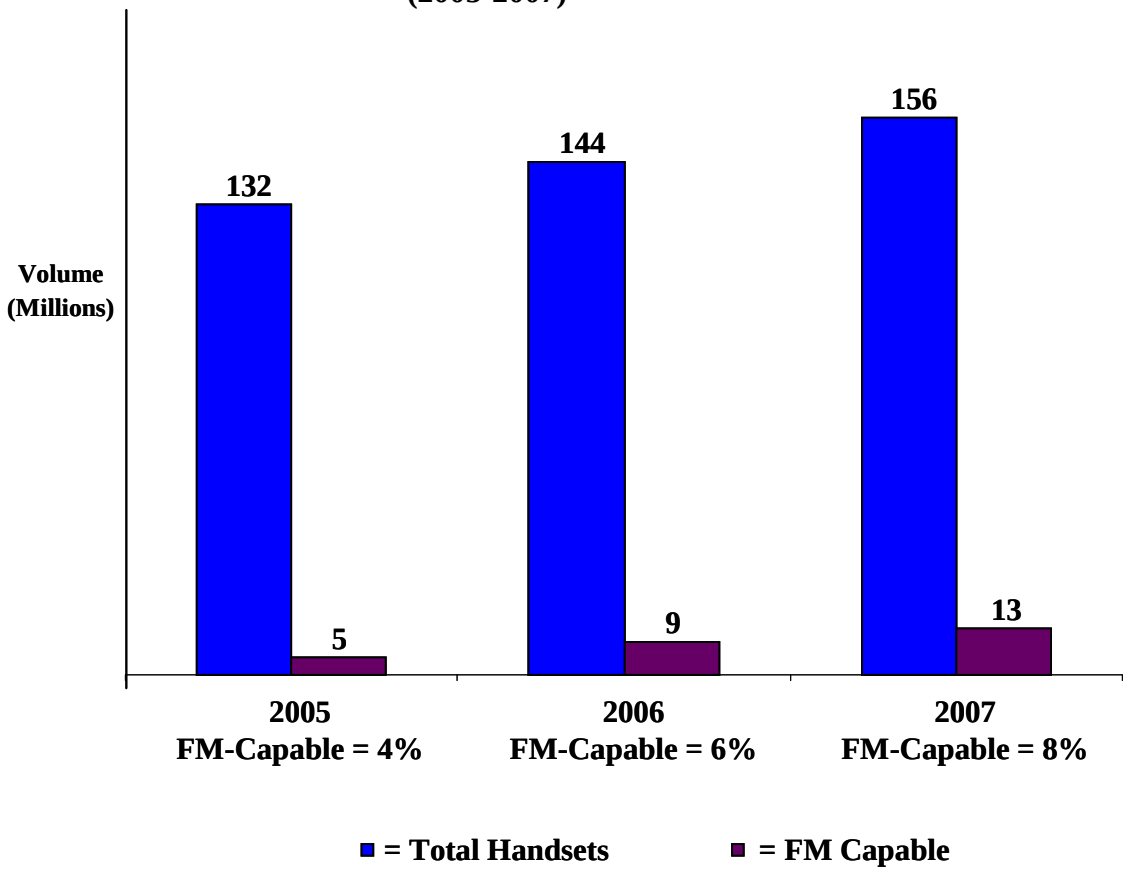
65 For our purposes, shipments are assumed to equal sales to end-users in the U.S. market.

66 Of the 12.5M FM-capable handsets, 10.8M (86%) were GSM.

67 This actually understates the difference since U.S. volumes are included in the global data. If U.S. data is eliminated from the global data, in 2007, *FM penetration worldwide increases to 34%* [(354-13)÷(1,150-354)]. Note that the penetration percentages (Exhibits VIII and IX) are for handsets sold in that year.

It should be noted that, under the diary system used to measure radio audiences, radio broadcasters do receive credit for listening that takes place on cellular phones. The respondents that complete and submit the diaries are instructed to record the radio programming to which they listen and where they listen (e.g., home, work, automobile). The respondents do not record the device (e.g., home table radio, automobile radio, MP3 device radio, cellular handset) upon which radio programs are received. Therefore, under the current diary system, listening on handsets is captured and reported, but the fact that the receive device was a cellular handset would not be captured nor reported.

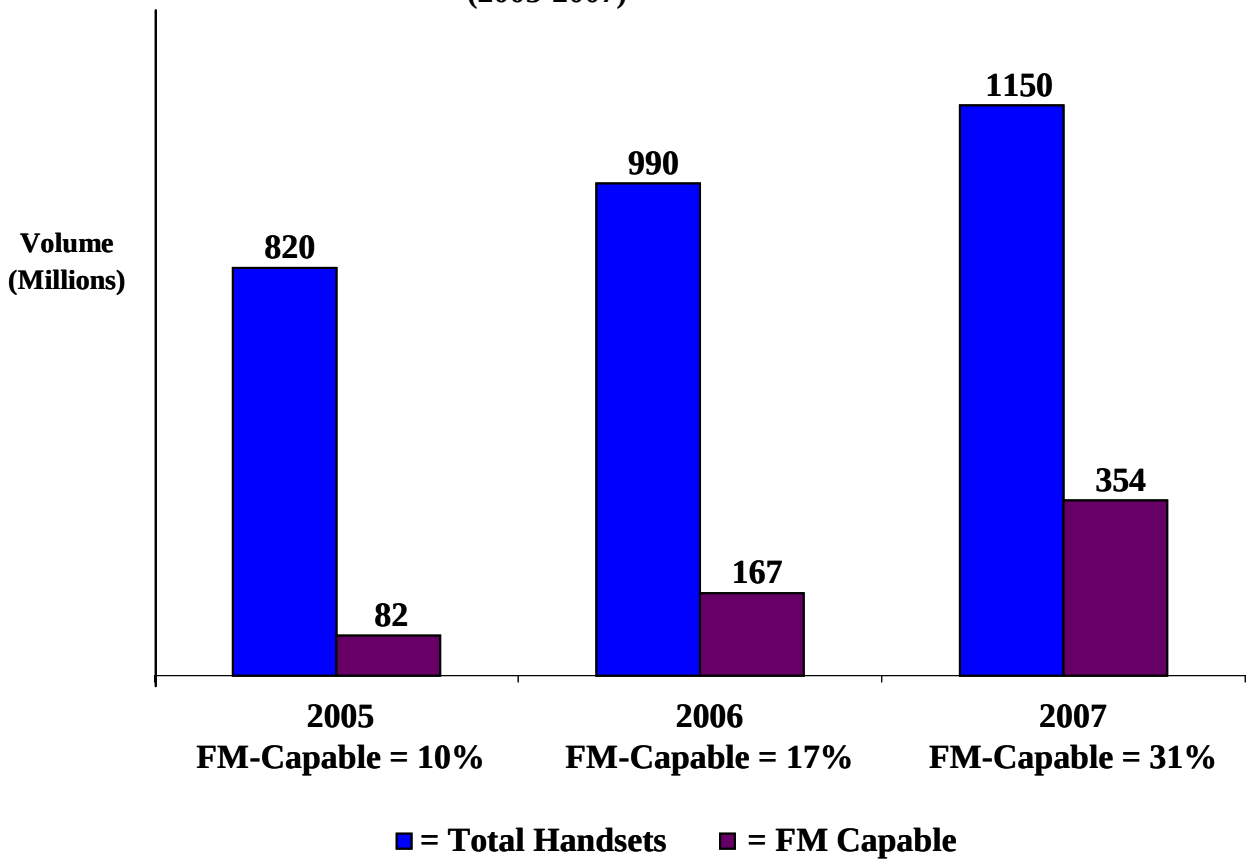
Exhibit VIII
FM-capable Handsets: U.S. Market
(2005-2007)



Source: iSuppli data prepared for NAB. All information and intellectual property contained in this Exhibit is the sole property of iSuppli Corporation.

The rate of growth for FM capability in the U.S. is expected to *lag* the world market. The reason for this is that, in developing countries where cellular radio penetration is increasing, bundling multiple functionalities into handsets meets market requirements and is cost effective. However, in the U.S., cellular subscribers continue to carry and use MP3 players or similar devices (e.g., iPods) for music (even playing the devices through their automobile stereo systems), although that means carrying both a phone and an MP3 or similar player.

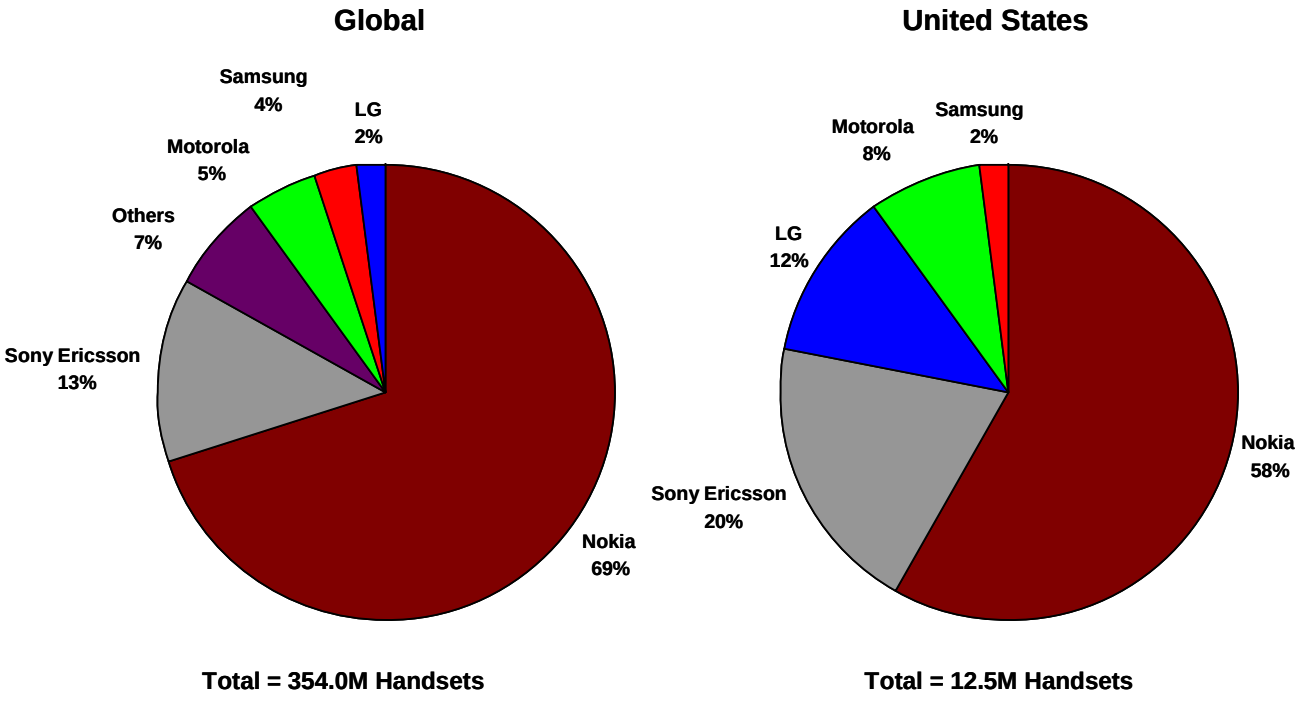
Exhibit IX
FM Capable Handsets: Global Market
(2005-2007)



Source: iSuppli data prepared for NAB. All information and intellectual property contained in this Exhibit is the sole property of iSuppli Corporation.

As shown on Exhibit X, in 2007, the leading manufacturer of FM-capable handsets shipped to the U.S. was Nokia with 7.3 million handsets (58% of the total handsets with FM capability shipped to the U.S.). The next largest FM-capable volume came from Sony Ericsson (2.5 million). The FM-capable handset shipments by the other large manufacturers were: LG (1.5 million), Motorola (1.0 million), and Samsung (0.2 million).

Exhibit X
FM Capable Handsets by Manufacturer: Global and U.S. Markets
(2007)



Source: iSuppli data prepared for NAB. All information and intellectual property contained in this Exhibit is the sole property of iSuppli Corporation.

D. Observations and Conclusions

1. The data show that, in 2007, only about 8% of U.S. cellular handsets sold (i.e., 12.5M out of 156M) were FM-capable and almost all of these were GSM phones.[68]

2. For broadcasters, the current penetration of FM-capable handsets in the U.S. market is not particularly relevant. What is important is that the embedded base of handsets in the U.S. turns over in approximately 19 to 20 months.[69] Assuming FM capability was added to a considerable portion of new shipments of U.S. handsets, within two years there would be substantial penetration of the embedded handset base by FM-capable phones.

3. To be successful in the U.S. marketplace, handset manufacturers must conform to the requirements of their customers, the cellular operators. The low level of FM radio functionality in U.S. handsets reflects the current requirements of the cellular operators. *It is almost certain that, if the U.S. cellular operators reversed themselves and required FM receivers in handsets, then the handset suppliers*

[68] FM-capable handsets constitute the maximum number of handsets that can receive FM broadcasts. If network operators do not enable the FM function, then handsets that are FM-capable but not FM-enabled are only a subset of the 12.5 million shipped to the U.S. in 2007.

[69] [Current Subscribers (YE 2007) ÷ Handset Sales (2007)] x 12.

would adjust rapidly and begin to supply such capability as a standard feature.

4. As the U.S. operators begin to "open" their networks, then the proportion of FM-capable handsets should increase as manufacturers, especially Nokia and Sony Ericsson, can be expected to move FM penetration in the U.S. towards the level (31% in 2007) in the global handset market. However, for the near-term future (i.e., the next two to three years), broadcasters should assume the "closed" model will predominate.

5. If broadcasters are going to persuade operators to increase FM penetration of handsets, then broadcasters will need to be able to explain clearly why FM capability on handsets constitutes an economic benefit to cellular operators. This will require broadcasters to understand cellular economics and position FM-on-handsets as being economically positive for operators. In order to be successful, FM-on-handsets must be shown to deliver material cost avoidance (i.e., in implementing the CMAS alert system) and/or material net revenue enhancement to the cellular operators.

6. The cellular business has *fragile economics* in which revenues are at least balanced, if not exceeded, by cash outflows for operating expenses (including, and especially, new customer acquisition and customer service), handset subsidies, network investment, and spectrum acquisition. Therefore, cellular operators may resist any initiatives by broadcasters that appear to reduce future revenues or increase costs, especially handset subsidies.

7. Cellular operators are increasingly dependent on revenue from non-voice services, such as music downloads. Broadcasters and cellular operators have a shared financial interest in music. A critical objection that cellular operators raise to FM-on-handsets is that free OTA music may compete with cellular music services.

8. The market share split in the U.S. between GSM and CDMA handsets is relevant to broadcasters because:

    a. FM radio on handsets is much more prevalent outside the U.S.;

    b. GSM is the predominant world standard for cellular networks, and FM radio on GSM handsets worldwide is relatively common (31% penetration of handsets sold globally in 2007); and

    c. FM radio functionality is much more likely on "world" GSM phones shipped to the U.S. than on CDMA phones made for the U.S. market (e.g., in 2007, *for handsets with FM capability*, FM radio was six times more likely on U.S. GSM handsets than on U.S. CDMA handsets).

9. The rate of growth for FM capability in the U.S. is expected to *lag* the world market. The reason for this is that, in many developing countries where cellular

radio penetration is increasing, bundling multiple functionalities into handsets meets market requirements and is cost effective. However, in the U.S., cellular subscribers continue to carry and use MP3 players or similar devices (e.g., iPods) for music (even playing the devices through their automobile stereo systems), although that means carrying both a phone and an MP3 or similar player.

10. Under the current diary-based audience measurement system, listening on handsets is being captured and reported (although the fact that the receive device was a cellular handset would not be captured nor reported). Therefore, the measurement system is in place to capture and report increased listening when FM-receive capability expands among the base of cellular handsets.

11. The major reasons cited by cellular operators to not include FM capability in U.S. handsets are as follows:

    a. **Commercial/Business Issues:** (1) no apparent consumer demand exists in the U.S. for FM on handsets; and (2) free over-the-air FM radio broadcasts would compete with operator pay music services; and

    b. **Form/Technical Issues:** Concerns include: (1) adverse impact on battery power; (2) need for a second internal antenna (or use of headset cord as an antenna); and (3) lack of FM coverage in rural areas.

IV. COMMERCIAL MOBILE ALERT SYSTEM (CMAS) OPPORTUNITY

Cellular operators are, and will continue to be, under pressure to participate in a national emergency alert system to be broadcast to handsets. FM-with-RDS is a candidate technology that appears able to meet FCC requirements.

This chapter provides the background and summary implications of the FCC's current rulemaking initiative. As noted below, the opportunity for broadcasters to define a win-win business case for cellular operators is current but time bound, driven by two factors: (1) the operators have to advise the FCC in the fall of 2008,[70] whether they will, or will not, participate in CMAS; and (2) the operators are exploring technology options for CMAS with their traditional technology vendors (e.g., Qualcomm for CDMA). The further along that operators proceed without considering FM-with-RDS as a potential solution, the more difficult it will be for broadcasters to intervene in the carriers' decision processes.

A. Background to the CMAS Rule

Since September 2001, public policy officials have undertaken several efforts to expand the scope of the traditional, broadcaster-oriented emergency alert ("EAS") system. **The goal is, and has been, that emergency messages are to be sent through a robust, system-of-systems that is intended to take advantage of Americans' multiplying sources of electronic communications.** These efforts include the FCC's own rulemaking proceedings to expand the scope of EAS, itself, to include not only broadcasters but also cable operators and satellite-based radio and direct broadcast satellite video providers.[71] Most recently, wireline telephone company providers of video services were added to the list of mandatory EAS participants.[72]

In November 2005, as part of its ongoing review, the FCC inquired in its *Further Notice of Proposed Rulemaking*, whether cellular operators should participate in the EAS mechanism:[73]

> *Wireless products are becoming an equal to television and radio as an avenue to reach the American public quickly and efficiently… What further steps should the Commission take to facilitate wireless provision of alert and warning? Should the Commission require wireless carriers to provide alerts and warnings? We note that many commenters in the underlying proceeding have advocated a point-to-multi-point, or cell broadcast approach to wireless alert and warning. In addition, commenters have identified technologies that enable wireless handsets to receive EAS alerts. [citing to CTIA Comments noting development of*

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[70] 30 days after the FCC amends the carrier licenses to authorize CMAS with the amendment expected as early as August, 2008.

[71] See, *Review of the Emergency Alert System, Second Report and Order*, EB Docket 04-296, FCC-07-109 (July 12, 2007), ¶11.

[72] *Review of the Emergency Alert System, Second Report and Order*, ¶50.

[73] *Review of the Emergency Alert System, Further Notice of Proposed Rulemaking*, EB Docket 04-296, FCC-05-191 (November 10, 2005) (footnotes omitted), ¶69.

> *"SMS and cell broadcast, as well as the possibility of augmenting new wireless devices to receive FM broadcast emergency alert messages or NOAA weather radio alerts."] We seek comment on these and other approaches to wireless alert and warning. Parties should address whether each approach permits use of a common messaging protocol. Finally, we seek comment on whether each approach would require customers to return and replace their current handsets and, if so, whether any financial impact of handset return would offset the public benefit of providing wireless alert and warning? Parties should address economic as well as technical issues in their comments.*

While willing to cooperate in the EAS process, wireless industry commenters argued in favor of a collaborative effort, given the need to adapt cellular networks to mass-broadcast-type message dissemination and/or the potential need to replace existing handsets with ones having the necessary chip sets.[74]

The FCC's inquiry into the appropriateness of cellular operators' participation in the EAS process was overtaken by enactment in October 2006 of the Warning Alert and Response Network (WARN) Act, which required the FCC to establish a regulatory and technical framework by which "commercial mobile service" providers (primarily cellular carriers) *voluntarily* may participate in a system to transmit "emergency" alerts.[75] The Senate version of the WARN Act's enabling legislation had authorized a broad-based "National Alert System" that "will transmit alerts across the greatest possible variety of communications technologies, including digital and analog broadcasts, cable and satellite television, satellite and terrestrial radio, wireless communications, wireline communications, and the Internet to reach the largest portion of the affected population."[76]

However, the House-Senate conference committee that drafted the compromise version of the legislation *stripped out all provisions of the WARN Act (other than its name) that related to development of an integrated National Alert System, leaving in place only the subpart of the broader program that authorized commercial mobile radio service (cellular) providers to transmit alert messages.*[77] Consequently, the parent SAFE Port Act's Title VI was no longer the "National Alert System," but one focused on "Commercial Mobile Service Alerts."

Under the WARN Act, as ultimately adopted, the responsibility for drafting "system-critical recommendations" regarding the nature and operation of a CMAS was delegated to a "Commercial Mobile Service Alert Advisory Committee," ("CMSAAC") under the FCC, which including representatives from cellular-providers, handset and

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74 See CTIA, *Comments*, EB Docket 04-296 (January 24, 2006), pp. 9-10.

75 SAFE Port Act of 2006, Title VI, Commercial Mobile Service Alerts of Public Law No. 109-347, § 602(a). Consequently, the FCC removed commercial mobile service providers from the scope of its 2007 review of the role of additional delivery "platforms" in the next generation of the EAS: "in light of passage of the WARN Act, we do not address commercial wireless carrier participation in EAS..." *Review of the Emergency Alert System, Second Report and Order*, ¶8.

76 H.R. 4954, 109th Congress, section 602(b)(4), as passed by the Senate on September 14, 2006.

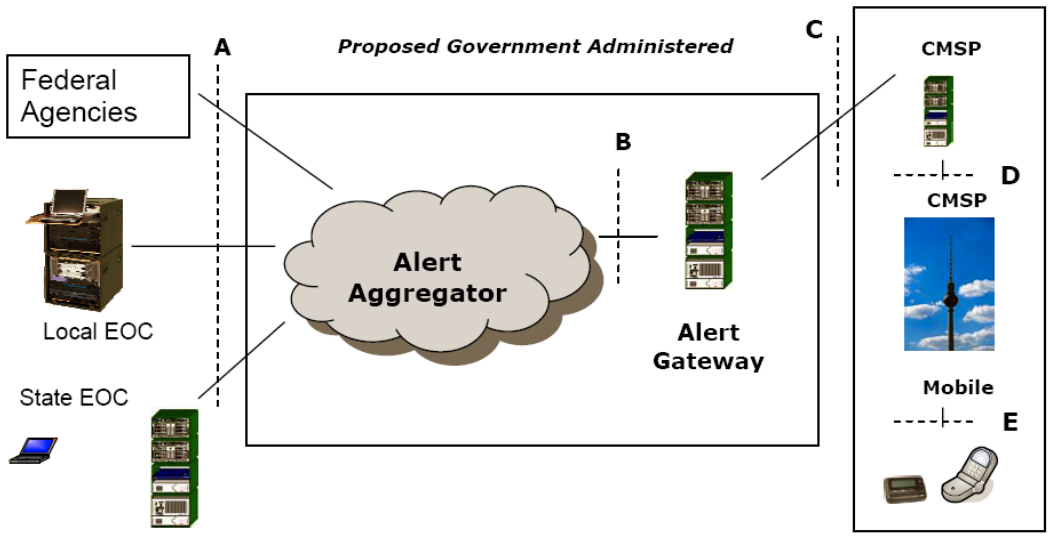
77 H. Rept. 109-711, at 105-106 (September 29, 2006).

technology providers, the emergency operations community, as well as broadcast interests. Given its narrow mandate, the CMSAAC focused on a centralized, text-oriented system that was compatible with the networks of national cellular operators.

On October 12, 2007, the CMSAAC issued its report, *Commercial Mobile Alert Service Architecture and Requirements* (*Final Report*). The *Final Report* recommended an architecture by which federal, state, and local emergency agencies would send messages to a federal "alert aggregator" which would operate an "alert gateway" that would transmit emergency, time-sensitive messages to the appropriate "commercial mobile service provider" for forwarding to its subscribers, potentially based on use of geographic coding/targeting. Exhibit XI sets out the CMSAAC's concept.[78]

The CMSAAC was deliberately "technology agnostic" about the way in which cellular operators would transmit messages over the "last mile" to their mobile subscribers. Thus, the Committee states that a wireless carrier's network "shall not be bound to use any specific vendor, technology, software, implementation, client, device, or third party agent, in order to meet the obligations under the WARN Act."[79]

Exhibit XI
CMAS Overview



Source: Commercial Mobile Service Alert Advisory Committee, *Final Report*, Figure 2-1.

Indeed, the *Final Report* described a "realistic" scenario in which a nationwide mobile service provider delivers emergency alerts using two technologies, and only a subset of devices in a given area support one or both technologies, and some devices might not support either technology. Exhibit XII shows how the CMSAAC illustrated this scenario.

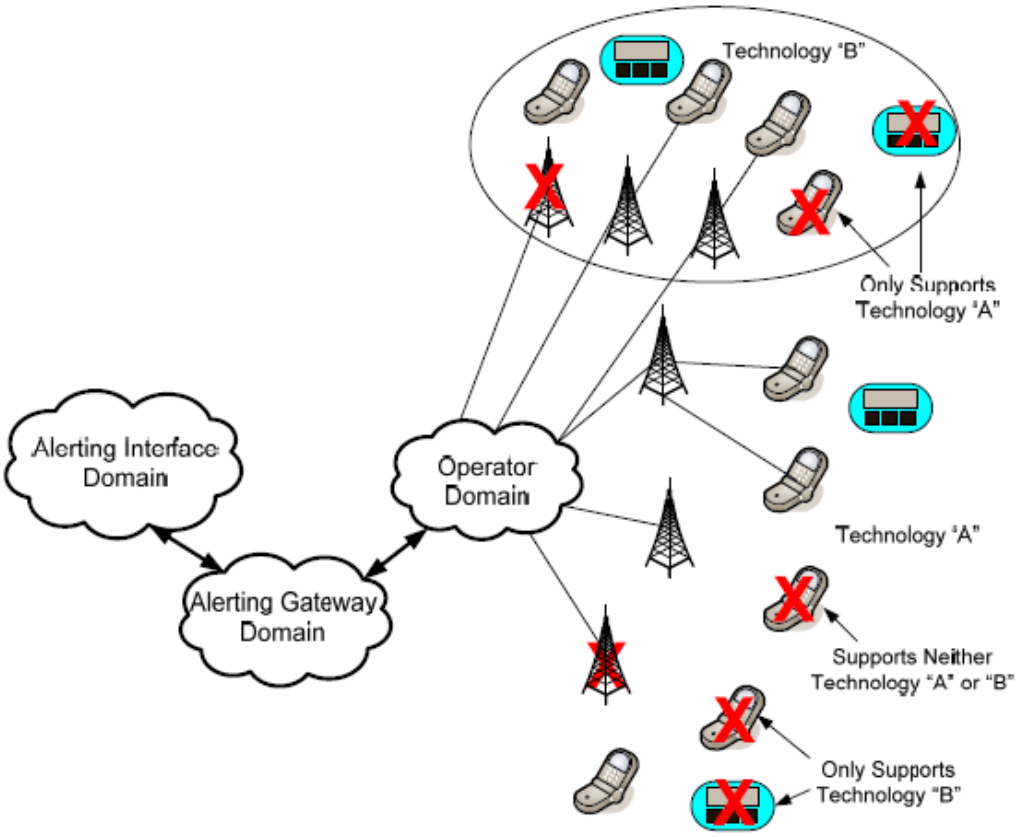
The CMSAAC argued that broadcast technologies (e.g., FM-with-RDS) not operated by mobile service providers were *definitionally* outside the scope of CMAS (because the

[78] ACRONYMS: EOC = Emergency Operations Center; CMSP = Commercial Mobile Service Provider.
[79] Commercial Mobile Service Alert Advisory Committee, *Final Report* (October 12, 2007), ¶5.1.

handsets belong to subscribers and so there would only be broadcaster-subscriber interaction). Nevertheless, the Committee recognized that such technologies could *supplement* a CMAS service by providing alerts to mobile devices that otherwise might not be able to receive them:[80]

> *Broadcast technologies such as MediaFLO, DVB-H, and FM/RBDS receivers are not considered as part of the CMAS. Service providers of these technologies do not hold commercial mobile service licenses, as they do not provide interconnect service, and are not licensed to transmit in the same channels as commercial mobile services. It is recognized that these technologies may provide supplemental alert information for the CMAS.*

Exhibit XII
Dual Alert Technology Scenario



Source: Commercial Mobile Service Alert Advisory Committee, *Final Report*, Figure 3-7.

[80] Commercial Mobile Service Alert Advisory Committee, *Final Report*, ¶5.1(7)(a).

In the CMSAAC's debate on this section of the *Final Report*, participants noted that there had not been the opportunity for full analysis of the use of FM radio's RDS capabilities. Some carrier representatives (e.g., Verizon, T-Mobile) noted, however, that their companies' had concerns regarding *mandatory* inclusion of FM receivers in handsets, but would not object to placing it in the "supplementary" category.[81]

Finally, the WARN Act also provided liability immunity for cellular operators.[82] Specifically, any commercial mobile service provider, including its officers, directors, employees, vendors, and agents, is immunized from any liability to a subscriber or user for "any act or omission related to, or any harm resulting from, the transmission of, or failure to transmit and emergency alert," so long as is it "meets its obligations" under the WARN Act.

B. The FCC's CMAS Rulemaking

On December 14, 2007, the FCC released the CMSAAC's recommendations in a *Notice of Proposed Rulemaking*. The FCC noted that, "This NPRM is the latest example of our commitment to enhance the redundancy, reliability and security of emergency alerts to the public by requiring that alerts be distributed over diverse communications platforms."[83] In this context, the FCC inquired:[84]

> *[W]hether a broadcast distribution model similar to that used to distribute EAS is consistent with the WARN Act and the CMAS. Could radio data systems like the Radio Broadcast Data System (RBDS), which do not require significant service provider infrastructure, nonetheless meet our goals for efficient delivery of alerts over the CMAS? What about emerging wireless broadcast technologies such as MediaFLO and DVB-H?*

In their pleadings in response to these questions, representatives of broadcast technology, (e.g., DataFM, Global Security Systems), and the NAB argued in favor of allowing FM-RDS capabilities to be a solution for delivery of emergency messages to cellular handsets.[85] On the other hand, cellular operators, including AT&T, argued against inclusion of FM-RDS as a *mandatory* solution. According to AT&T, use of FM capabilities would: (1) require FM tuners in handsets, a feature not currently in specification given to its handset manufacturers; (2) raise technical issues regarding antenna configuration and battery usage; and (3) require solutions to offset lack of FM radio station coverage in rural areas.[86] Verizon more narrowly opposed a mandatory FM tuner requirement:[87]

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81 See Commercial Mobile Service Alert Advisory Committee, Transcript (October 3, 2007), pp. 97-111.

82 WARN Act Section 602(e)(1).

83 Commercial Mobile Alert System, Notice of Proposed Rulemaking, PS Docket 07-287, FCC 07-214 (December 14, 2007), ¶4.

84 Commercial Mobile Alert System, Notice of Proposed Rulemaking, PS Docket 07-287, FCC 07-214, ¶10.

85 Global Security Systems for example, suggested solutions to the "second antenna" issue arising from the differing frequency bands used by FM compared to cellular services, including a tuned internal antenna, which could act as a redundant reception mechanism if the local cell site failed in an emergency situation. Global Security Systems, LLC *Ex Parte* Filing (April 8, 2008).

86 AT&T, *Reply Comments,* PS Docket 07-287 (February 19, 2008), pp. 8-10.

87 Verizon Wireless, *Reply Comments,* PS Docket 07-287 (February 19, 2008), p. 4.

> *Should the federal government elect to develop a system using FM radio infrastructure to broadcast alert messages, then [wireless service providers] that elect to participate in CMAS should be able to determine whether to elect to make handsets with FM radio chips available to their subscribers to receive alerts. Under no circumstances, however, should the Commission mandate that handsets include FM radio chips.*

Wireless providers also raised concerns with another technology, cell broadcasting, that was claimed[88] to provide a relatively quick and off-the-shelf CMAS solution, particularly for carriers using the GSM standard (about half the U.S. market). More specifically, cell broadcasting capabilities are incorporated in the GSM standard and, apparently, are present in some GSM handsets.[89] The Dutch government is running a trial cell broadcast alerting system in which the networks of some wireless operators were upgraded for cell broadcast, with the government reserving some capacity for emergency alerts, with carriers able to send messages for their own purposes or commercially to sell the capability to content providers.[90] Cell broadcast messages apparently can be targeted down to individual transmission towers, or to handsets in a group, and different channels can be used to support alerts in multiple languages.[91]

Nonetheless, AT&T, the largest GSM operator in the U.S., believed cell broadcast also was not yet ready for deployment as *the* CMAS technological solution and that the choice of method of reaching a carrier's subscribers should be left to the carrier:[92]

> *[T]he Commission should not mandate cell broadcast for alert transmissions. Although cell broadcast shows promise for GSM and UMTS, mandating any particular technology would unnecessarily constrain carriers and inhibit the technological evolution of the CMAS. Every technology is subject to limitations. In the case of cell broadcast, the fact that the technology is in limited deployment in networks and mobile handsets, has the potential to drain handset batteries, and has been subject to limited field testing all counsel against a transport technology mandate… With respect to cell broadcast equipped handsets that currently may be available in the marketplace, AT&T notes that such devices lack full CMAS capabilities…*

Further, cell broadcast technology is not a specified element of CDMA-based services (the standard used by the other half of U.S. cell phone subscribers), and thus CDMA-based carriers argued against inclusion of a cell broadcast requirement, due to the additional development work that would be involved.[93]

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88 CellCast Technologies, LLC, *Reply Comments*, PS Docket 07-287 (February 19, 2008).

89 CellCast Technologies, LLC, *Reply Comments*, pp. 9, 11 (noting emergency messaging tests by the Dutch government and claimed cell cast reception capabilities on certain GSM handsets from Motorola, Nokia, Sony Ericsson, LG, and Samsung).

90 Cell Broadcast Forum, *Cell Broadcast in Public Warning Systems* (November 2005), pp. 12-13.

91 Cell Broadcast Forum, *Cell Broadcast in Public Warning Systems*, p. 11.

92 AT&T, *Reply Comments,* PS Docket 07-287 (footnotes omitted), pp. 7-8.

93 See Alltel, *Reply Comments*, PS Docket 07-287 (February 19, 2008), pp. 1-2, note 6

On April 9, 2008, the FCC issued its *First Report and Order* in the CMAS proceeding. It largely adopted the CMSAAC's recommendations, including the architecture illustrated above. However, the FCC expressly addressed the role of FM-RDS as a potential distribution technology:[94]

> *Several parties express support for an FM-based CMAS solution such as that provided by ALERT-FM and Global Security Systems. The CMSAAC however considered the costs and benefits of Radio Broadcast Data System (RBDS) and other FM-based alert and warning solutions, and found them to be infeasible for the CMAS. Moreover, a number of parties have expressed reservations about these technologies. Nonetheless, in keeping with our overall policy to maintain technological neutrality, we do not require or prohibit the use of ALERT-FM, RBDS or similar systems as the basis of the CMAS … so long as they are able to transmit emergency alerts in a manner consistent with the rules we adopt today.*

Further, the FCC recognized the limitations of current cellular technologies and the fact that cellular operators may employ technologies with differing current feature sets and capabilities, such as GSM and CDMA. Thus, it initially required that wireless operators offering a CMAS service engage in geo-targeting only down to the county level.[95] In addition, the FCC required operator to offer alert messages only in English, while encouraging "the wireless industry and the public safety community to expeditiously develop and implement capabilities to deliver alerts in languages in addition to English."[96] Finally, the FCC recognized that in order to be "CMAS-compliant," handsets would have to ensure an alert signal would be received by users with hearing or sight impairments and thus required alert use both specified audio and vibration cadences:[97]

> *We strongly encourage CMS providers to coordinate with device manufacturers to utilize existing technologies to comply with these requirements as soon as possible. … We recognize that incorporating capabilities for a common audio attention signal and a common vibration cadence on the many devices that we expect to be offered to the public will take time to develop and implement successfully. However, we believe that assuring full access for all Americans is sufficiently important that equipment may not be considered CMAS compliant unless it includes both the common audio attention signal and the vibration cadence adopted in this Report and Order.*

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94 *Commercial Mobile Alert System, First Report and Order,* PS Docket 07-287, FCC 08-99 (footnotes omitted), ¶37 and note 113.

95 *Commercial Mobile Alert System, First Report and Order,* ¶56.

96 *Commercial Mobile Alert System, First Report and Order,* ¶77.

97 *Commercial Mobile Alert System, First Report and Order,* ¶¶66-67.

In short, the FCC envisioned the CMAS systems as incorporating a basic set of alerting capabilities that could, and should, be expanded over time. Each cellular operator was given the discretion to opt-in to the emergency alert system and, if participating, free to employ one or more technological solutions for last-mile alert message distribution to its subscribers. Further, the process will require cellular providers to work with their handset suppliers and network vendors to define a CMAS strategy to minimize the cost and maximize the potential commercial benefits from offering a CMAS-compliant emergency service. In this context, cellular operator "costs" can include: (1) cash outlays for network modifications; (2) cash outlays for handset subsidies; and (3) revenue foregone due to network congestion and/or other factors. For example, if cellular operators perceive that FM tuners in handsets would compete with the carriers' own music services, then that would be a "cost" to the operator.

Finally, although the CMAS system is designed to process text messages of no greater that 90 characters, the mode of delivery of those 90-character messages to handsets (e.g., voice vs. text) appears to be a choice of the mobile service provider. For example, according to the FCC:[98]

> *Text-to-speech (TTS) enabled wireless mobile devices are becoming increasingly common, and we strongly encourage all participating CMS providers to offer devices with such capabilities so that blind individuals and those with severe visual impairments can obtain the public safety benefits of commercial mobile alerts. We note that many of the requirements that we adopt today for the first generation of CMAS are intended to enable the provision of text-based alerts to the public. Although we envision that the CMAS will evolve to include audio and video service profiles, we find that at this initial stage of the CMAS, it would be premature to address the CMSAAC's recommendations regarding output mode/displays for such future service profiles.*

However, so long as a service provider's gateway can receive and process text messages, and the handset or other device otherwise meet requirements as to vibration and tonal alert cadences and alert prioritization,[99] there would appear no requirement that a device also must be able to process a text message, even if it provides the message in audio format.[100]

C. The CMAS Implementation Timetable

The FCC's April 9th release of the CMAS rules (and their publication in the *Federal Register*) triggers a series of deadlines for cellular operators. In its October 2007 *Final Report*, the CMSAAC attempted to define a realistic time line for implementation of the CMAS system once the rules and standards were in place, a process that the Committee envisioned extending through 2010. The Committee noted that the end-to-end CMAS

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98 *Commercial Mobile Alert System, First Report and Order,* ¶69 (footnote omitted).

99 *Commercial Mobile Alert System, First Report and Order,* Appendix C, promulgating new 47 CFR Part 10, Subpart E (Equipment Requirements).

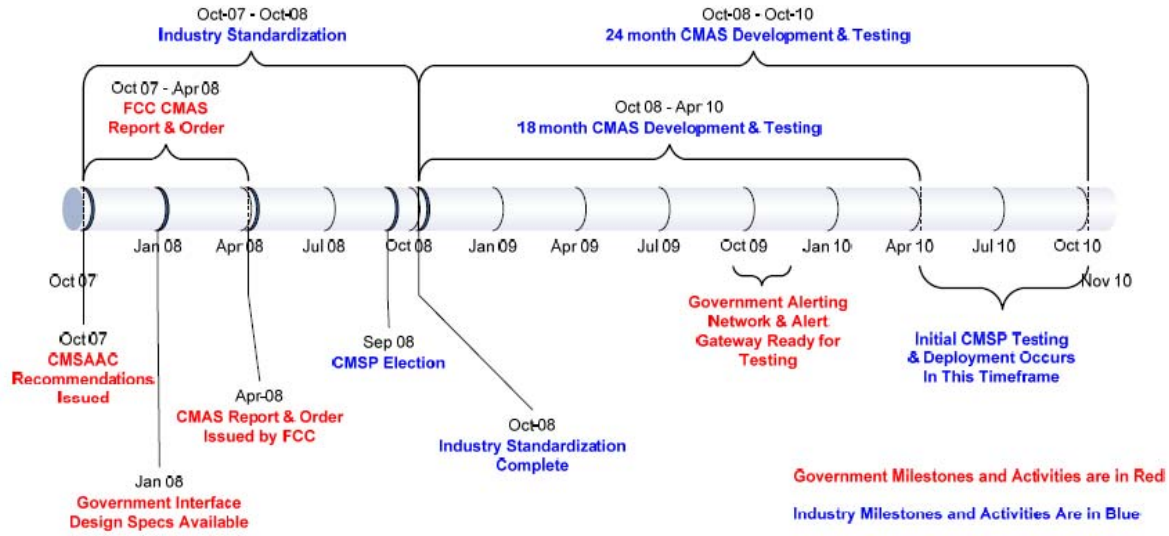
100 However, an issue might arise if hearing impaired users who rely on handsets for text messages would file complaints with the FCC if an operator's implementation cannot provide an alert in text format.

development and implementation process was a complex one, including a cellular operator's implicit commitment to develop mobile devices that support CMAS using the operators chosen last-mile distribution technology:[101]

> *Typical development cycles for a development of this magnitude require up to 12 months of standardization work in the appropriate standards bodies once the requirements are finalized followed by 18-24 months implementation and deployment before availability of the service and supporting mobile devices. … However, the technology, capabilities for deployment, and mobile devices may not be available for initial deployment and subscriber purchase potentially 12 months plus 18-24 months (approximately 30-36 months) following the [CMSAAC] recommendation, due to the required standardization and development cycles for the technology and capabilities of the mobile devices. Full deployments may not occur until a much later timeframe via a phased implementation.*

Based on these considerations, the CMSAAC suggested a potential timeline (Exhibit XIII) for CMAS implementation. Cellular operators are required to elect their participation to provide CMAS alerts by September 2008.[102]

Exhibit XIII
CMAS Timeline



Source: Commercial Mobile Service Alert Advisory Committee, *Final Report,* Figure 12-1.

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[101] Commercial Mobile Service Alert Advisory Committee, *Final Report*, ¶12.2.1. Note that The Committee assumed that network operators would continue to define handset requirements (i.e., the "closed" model). Under an "open" network model, the handset manufacturers would become relatively more important to the CMAS process.

[102] Operators may later withdraw if they so choose.

The CMSAAC, however, cautioned that:[103]

> *There are factors outside of the CMSP's [commercial mobile service provider] direct control that will influence the deployment and availability of CMA service. These factors include manufacturer development cycles for equipment in the CMSP infrastructure, manufacturer commitment to support the delivery technology of choice by the CMSP, and* mobile device manufacturer development of the required CMAS functionality on the mobile devices. *Typically, a CMSP will have equipment from multiple manufacturers deployed in the CMSP infrastructure. Multi-vendor environments require feature availability and deployment alignment, and require interoperability testing between the different manufacturers equipment. Also, if a CMSP chooses a particular technology to transmit alerts (e.g., cell broadcast), if a vendor with which a CMSP has a relationship chooses not to develop the same capability, then the CMSP may be forced into not electing to transmit alerts (at least not "in whole").*

In making these assumptions, the CMSAAC assumed that the federal government, as operator of the "Alert Aggregator" and "Alert Gateway" function would meet their standardization deadlines. However, in its *First Report and Order,* the FCC stated that the Federal Emergency Management Agency (FEMA) *had declined to fulfill the aggregator/gateway operator functions* as it had been expected to do, due to claimed legal restrictions.

Consequently, CMAS implementation is in a rolling delay until the federal program operator is identified.[104] Compliance with the CMAS rules will be delayed until 10 months after the FCC announces the federal government entity [which may be a contractor] that will provide that functionality, an outcome that the FCC viewed as unclear:[105]

> *[T]imely identification of a federal agency capable of fulfilling the aggregator/gateway functions recommended by the [CMSAAC] is essential to bringing the concrete public safety benefits of a CMAS system to the American people. We are hopeful that any bars that prevent FEMA or some other entity within DHS from fulfilling these roles will be lifted expeditiously. We will work with our Federal partners and Congress, if necessary, to identify an appropriate government entity to fulfill these roles, whether that is FEMA, another DHS entity, NOAA or the FCC.*

Nevertheless, it can be expected that cellular industry participants will begin preliminary implementation steps even as the search for a federal operator for the

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[103] Commercial Mobile Service Alert Advisory Committee, *Final Report*, ¶12.2.1 (emphasis added).

[104] At least one large defense contractor has expressed interest in performing the aggregator/gateway functions under contract to a government agency.

[105] *Commercial Mobile Alert System, First Report and Order*, ¶2 and ¶18.

aggregation/gateway function continues. ***Consequently, broadcasters interested in proposing an FM-RDS solution to meet CMAS requirements have a short-term window to interest cellular operators in placing FM tuners in handsets as an element of the operators' CMAS implementation planning.***

D. Observations and Conclusions

1. The CMAS rules reflect the FCC's implementation of a specific Congressional mandate to rely on a broadly-based advisory body, the CMSAAC, to develop CMAS technical requirements. In so doing, the FCC agreed with the recommendation of the CMSAAC and representatives of cellular operators and broadcast interests, that CMAS be "technology neutral," giving operators the flexibility to use the distribution method of their choice, including FM radio.

2. Implementation of CMAS reception capability in handsets *necessarily will require interaction between a cellular operator and the multiple vendors whose handsets the carriers distribute*. Handset vendors may have different cost and development lead time profiles for various solutions. Therefore, a carrier may find that multiple approaches to CMAS reception may be appropriate, at least in the near term.

3. Wireless carriers using the CDMA standard (e.g., Verizon, Sprint) may be the most interested in a cost-avoidance argument for using an FM solution, since "cell broadcast" mechanisms apparently are not defined or deployed in CDMA networks or handsets. Conversely, CDMA handsets have far lower penetration of FM tuners than GSM, so more development and deployment efforts would be required to ensure the broad installed base of FM-capable tuners to make a viable FM-based CMAS solution.

4. Wireless carriers using GSM have at least *some* cell broadcast capabilities installed. The percentage of FM-capable handsets deployed in GSM networks is higher than CDMA networks, although the largest GSM carrier, AT&T states that it has not included FM reception in the current handset requirements it has provided to its handset vendors.

5. Development work will be needed to permit handsets to respond appropriately to messages, including alert tones and vibrations, prioritization of messages (and end-user control over which messages to be alerted to), geo-targeting, etc. This issue was endemic to all solutions and is most problematic for CDMA operators.

6. Broadcasters will need to work with providers of FM-RDS services to assure that RDS software is available that will: (a) meet both alert message technical standards and performance requirements; and (b) be compatible with handsets from the range of vendors whose products a particular cellular operator distributes.

7. Broadcasters interested in proposing an FM radio solution to meet CMAS requirements have a short-term window to interest cellular operators in placing

FM tuners in handsets as an element of the operators' CMAS implementation planning.[106] This window is driven by two related factors: (a) in September 2008, cellular operators must opt in or out of CMAS, such election most likely requiring some advance consideration of technical options for CMAS; and (b) the more operators work with their traditional suppliers, the less likely will consideration be given to FM radio as a CMAS solution.

8. The centralized CMAS architecture adopted by the FCC based on CMSAAC's recommendations, is distinct from the federal-state-local collaborative system underlying the current EAS structure. Apparently, an alternative that provides cellular subscribers with access to alert messages by means of EAS reception by FM-equipped wireless handsets (in contrast to having FM-equipped handset reception of CMAS alert messages) was not considered by CMSAAC, most likely because the FCC and CMSAAC were charged by Congress to develop a specific alerting system for commercial mobile service operators.

[106] Under section 602(b)(2) of the WARN Act, cellular providers must notify the FCC of their election to transmit CMAS alert messages within 30 days of the FCC issuing rules amending cellular licenses to authorize participation in CMAS. Those rules must be issued within 120 days after the FCC approves technical standards for CMAS. *Since the FCC approved the technical rules on April 9, 2008, cellular operators must make their election no later than 150 days following that date, or by early September 2008.* If the providers elect to participate, they must agree to transmit messages in accordance with the protocols and technical standards adopted by the FCC. If the cellular provider elects not to participate, it must "provide clear and conspicuous notice at the point of sale of any device with which its commercial mobile service is included, that it will not transmit such alerts via the service it provides for the device." Section 602(b)(1)(B).

APPENDICES:

A. Sources

B. Authors' Biographies

APPENDIX A: SOURCES

A. ANNUAL REPORTS
B. ARTICLES
C. FEDERAL COMMUNICATIONS COMMISSION
D. INTERVIEWS
E. LEGISLATIVE MATERIALS
F. PRESS RELEASES
G. STUDIES
H. WEBSITES

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APPENDIX B: AUTHORS' BIOGRAPHIES

Authors' Biographies

Joseph S. Kraemer, Ph. D.

Dr. Kraemer is a Director at the Law and Economics Consulting Group (LECG), a consulting firm with expertise in the business and financial issues that affect industries undergoing structural change. For over 25 years, he has worked with, and served as counselor to, senior management at communications, media, and high-tech companies in Asia, Europe, and the Americas. He teaches business strategy and marketing courses at both the Georgetown University McDonough School of Business and the Kogod Business School at American University. Dr. Kraemer was designated a "Digital Television Pioneer" by the Consumer Electronics Association (CEA).

Dr. Kraemer has been consulting on digital television issues since 1996. He co-authored *Digital Television in a Digital Economy: Opportunities for Broadcasters*. He also testified before the Senate Commerce, Science, and Transportation Committee on ways of expediting the broadcast digital transition and analyzed the economic implications for the broadcast industry of the choice between the COFDM and the 8VSB modulation standards. Recent publications and presentations include: *Study of the Impact of Multiple Systems for Mobile/Handheld Digital Television; An Assessment of the Present and Future State of the Broadcast Television Industry*; *Trends in Competitiveness of Telecommunications Markets* (with Richard O. Levine and Randolph J. May); *Summary of Strategic Trends in the U.S. Telecommunications Industry*; *Telephony, Television, and the Internet*; and *Digital Television in the United States: Long Fuse and Big Bang*.

Richard O. Levine, Esq.

Richard O. Levine, currently of counsel to Constantine Cannon LLP, is a former Director of LECG, LLC. He has over 20 years' experience advising clients on market, technology, and regulatory issues as they affect strategic business decisions, including entry into new markets. Recently, Mr. Levine has focused on issues related to the digitization of "mass market" communications, including the introduction of digital television, and the implications of this transition for those who create and distribute content in digital form. He has also undertaken analyses supporting the reform of regulation of traditional telecommunications services in light of the convergence of wireline, cable, and wireless communications networks.

Prior to entering private practice, Mr. Levine served as Director of Policy Planning at the U. S. Department of Justice's Antitrust Division, where he participated in the drafting and implementation of the AT&T Divestiture Decree. Mr. Levine has a J. D. degree from the Harvard Law School and a B. A. (economics) from Columbia University.

He is a co-author of *Digital Television in a Digital Society: Opportunities for Broadcasters* (1998) and *Updated Edition* (2002), and *Interconnection Without Regulation: Lessons for Telecommunications Reform from Four Network Industries* (2005).