1 improvements, both in terms of first fix and accuracy. This
2 is coming from the use of faster DSP and improved GPS
3 algorithms. Thank you.
4 MR. HATFIELD: Thank you very much. Our next
5 presenter is from Sirf Technology.
6 MR. CHADHA: Hi, my name is Kanwar Chadha. I'm
7 the founder of Sirf Technology. Sirf is a start up company
8 focused on providing GPS chip set and core IB for multiple
9 markets. And today we will discuss the E-911 based
10 solutions based on handsets.
11 I do want to emphasize upfront that whatever
12 location technology we choose as a country, we have to focus
13 on where the future potential is, not necessarily where the
14 existing infrastructure is. The technology has to be useful
15 to consumers for E-911, and potentially for evaluative
16 services. And significant investment, whether it's in
17 millions or tens of millions or hundreds of millions, is
18 going to be needed to make the technology and infrastructure
19 work together. It's important to invest that wisely.
20 Main features of Sirf's location architecture is
21 that it's based on GPS in handsets. It does improve on the
22 performance of traditional GPS technologies and we'll go
23 over some of the things it does better. It supports more
24 than the standard GPS, as well as more than just network-
25 assisted GPS. In fact, it has three modes. It supports

1 autonomous, network-assisted and network-driven environments
2 and I'll talk a bit about that.
3 It can provide location information independent of
4 the networks, so it will work in amps, D-AMPs, GSM, CDMA,
5 any kind of environment. We do believe that open interface
6 standards will drive the technology into the marketplace and
7 there is significant activity going on in DIA groups to
8 standardize on the error interfaces.
9 One thing about handset technology is that it
10 allows people to get the technology at a price point in a
11 manner, and keep aware of the technology as it changes. And
12 we'll go over some of those.
13 Why GPS? As my colleague from SnapTrack has
14 already talked about, there is significant investment going
15 into building a location infrastructure based on GPS. And
16 we are taking advantage of that infrastructure and combining
17 it with some of the wireless network's capability. It has a
18 much better potential for consumers in the long run. With
19 DGPS, you can get accuracy five to 15 meters. And today,
20 DGPS are expensive, but in the next two to three years,
21 there will be a nationwide deployment of DGPS, so any GPS
22 chip set itself will be able to receive the DGPS signal,
23 just like we receive the signal from the GPS satellites and
24 get that accuracy.
25 It does provide compatible decross (phonetic)

1 multiple networks and, as you have seen the results from
2 SnapTrack, as well as you will see some of the trials done
3 by IDC, we can support multiple networks very easily.
4 One thing to keep in mind is handsets upgrade is
5 very fast. So thinking with Legacy issue, we have to keep
6 in mind, people do upgrade their handsets. And every two to
7 three years, you will see that enough, that most of the
8 handsets will have this technology built in. And with
9 proper implementation, carriers, that rate can be improved
10 even more.
11 And the technology cost, we have to believe in the
12 silicon and the volume. Every two to three years, the
13 silicon enables you to put more and more features into the
14 architecture, and the volumes of handsets will drive the
15 cost down. What used to be $100,000 computer a few years
16 back probably you can get for $599 today. And similar
17 things are going to happen with the handset DGPS technology.
18 There are some problems with traditional GPS in
19 terms of performance, as well as accuracy in open canyons,
20 dense foliage, indoors. But there is no reason why those
21 problems cannot be addressed by common architectures good
22 for autonomous GPS, as well as for wireless assisted GPS.
23 Other issues with GPS have been power consumption, size,
24 cost and how to integrate into the handsets.
25 What Sirf has done is, first of all, we have

1 improved the performance of autonomous GPS. It's very
2 important to have a good autonomous GPS performance, because
3 that gives you the maximum freedom from various networks.
4 This is a default mode for getting a position if the network
5 assist does not work. So having a good autonomous GPS
6 performance is good. And the results we have show that it's
7 reasonable to expect that autonomous GPS will work
8 reasonably well in open canyons, in one to two story houses,
9 as well as in one to two story parking lots.
10 Obviously, in a multi-story building and some of
11 the more complex environment, you will have some issues.
12 But probably the money is better spent that you're getting
13 the consumer to use wireless phones in those kind of
14 environments.
15 Also, with the wireless assist, especially in
16 terms of getting some type of assist, you can improve the
17 performance accuracy more. Power consumption, site and cost
18 can easily be handled by looking at the silicone technology
19 curve. A GPS receiver is this size, which is pretty easy to
20 put into a handset. And this is a free functional GPS
21 receiver. In the handset, you can share some of these
22 resources and the size is probably more like this chip.
23 So the size constraints, the power constraints,
24 can easily be handled just looking at the packaging of
25 silicone technology.

1 Let us look at three modes I talked about. These
2 are slightly different from what Dr. Birchler described
3 initially. The autonomous mode is a traditional GPS mode
4 where all calculation is done in the handset. We define
5 that network-assisted mode where the calculation is still
6 done in the handset, but the network provides certain
7 assists and the assists are approximate location, DGPS
8 correction if it's not directly from the loss of satellite,
9 and the data, with traditional GPS receivers, we need to
10 collect from the GPS satellites.
11 The third, approach is the network central or
12 network-driven approach, where you can combine GPS with
13 other network-based technologies to get the position. There
14 are different trade offs. Autonomous more clearly has the
15 lowest impact on the infrastructure, and as I said, this is
16 a default mode. If nothing else works, GPS autonomous mode
17 will give you a position independent of any network. And
18 the performance of autonomous mode can be improved by having
19 some sophisticated software so that the autonomous mode
20 keeps the GPS receiver in what we call a hard mode, and you
21 will get a positioning anywhere between three to eight
22 seconds with that mode.
23 That assisted mode, of course, overcomes some of
24 the start up performance issues and provides the capability
25 in indoor type of environment. Network driven does have

1 some impact on the similar side, the network side, in terms
2 of band width and computations, but that one piece there is,
3 you could combine GPS with some network centered
4 technologies like has been done in CDMA network.
5 We also have to keep in mind what the consumer is
6 looking for. They are not only looking for emergency
7 assistance. In the long run, they are looking for certain
8 services, in terms of navigation, in terms of tracking, in
9 terms of finding their kids. And flexible architecture
10 allows them to have all these capabilities. Autonomous mode
11 probably is very useful for navigation and tracking.
12 Network assisted and network driven modes are useful for on
13 demand positioning such as in emergency response.
14 Their expectations are, instant position, accurate
15 and for almost free. And I think these can be met. This is
16 an example of some of the drives. We have done two, open
17 canyon and like San Francisco. And you can see the
18 satellite visibility is going to be pretty low in this kind
19 of environment.
20 But even in an autonomous mode, the accuracy of
21 GPS is pretty good. The solid line is the actual track and
22 the line which goes around, the blue line, is what GPS
23 receiver tells you. So it's easy to achieve reasonable
24 accuracy, even in autonomous mode in an open canyon type of
25 environment.

1 As for the cost issues concerned and Legacy
2 handsets, first of all, with the GPS attachment, you can
3 upgrade some of the Legacy handsets. Obviously not all, but
4 a significant amount of those could be upgraded. And as we
5 see the IDC integration, which means you integrate the
6 silicone used for GPS with wireless silicone, the cost can
7 be brought down to easily less than $10.
8 In the end, what you will get is a form which not
9 only provides the E-911, but provides other benefits to the
10 consumer for getting location based services. The
11 technology is available today. It is cost effective and
12 generally will meet lower costs by taking advantage of the
13 volumes of handsets. You can provide a retrofit. The
14 accuracy is much better and will improve with time as the
15 GPS infrastructure evolves and it's compatible across
16 multiple networks.
17 If you look at the future potential, this is the
18 foundation we are laying down for location-based services
19 and emergency response is probably one of them. Consumers
20 will pay for the capability they get in the handsets. Thank
21 you.
22 MR. HATFIELD: Thank you very much and you've all
23 done such a good job of keeping on time that we're actually
24 a little bit ahead. So what I thought I'd do here is let
25 each of you maybe respond to what you heard, one or two

1 additional points that you wanted to make and were unable
2 to, I would welcome that now. And why don't we start back
3 over here with -- oh, I'm sorry. Sorry about that. We're
4 not running so well. I didn't have enough coffee this
5 morning to make up for last night.
6 MR. KNAPP: But now that you've had fair warning -
7 -
8 MR. HATFIELD: Right, so, I'm very sorry. We'll
9 start with the representative from Aerial Communications.
10 MS. FRASCO: Thank you very much. My name is Beth
11 Frasco. I'm head of radio planning for Aerial
12 Communications. I'm responsible for the design, planning
13 and strategy of our current and future radio networks. As a
14 part of my responsibilities for the last year and a half or
15 so, we've been looking at ALI issues for my company and how
16 we're going to comply with the FCC's Phase II mandate. And
17 among the various positioning methods that we've looked at,
18 I'm going to be speaking about the Enhanced Observed Time
19 Difference Method, which I'll call E-OTD from this point
20 forward. Next slide, please?
21 First of all, let me make one thing really clear.
22 We're not a vendor, we're not a manufacturer, we're an
23 operator. We're a consumer of this technology to meet the
24 FCC's Phase II mandate. We're in a very specific situation.
25 We're a PCS A and B block licensee. We've been in operation

1 for just about two years now. It's a fairly small installed
2 base of customers. We also use GSM technology which makes
3 us in a particular category, as well.
4 Let me tell you about a particular situation. We
5 believe that this particular method that I'm speaking about,
6 E-OTD, has some really attractive components to it for us,
7 and we would like to have -- it makes the option to use this
8 particular technology, which is handset based, desirable.
9 Next slide, please.
10 Just a quick overview of E-OTD. It is a
11 triangulation based technique. It does require multiple
12 base stations to do positioning, and it is a handset based
13 solution. The one thing that is quite unique about E-OTD in
14 comparison to the other methods that we've seen today is
15 that it does not use GPS in the handset. It does not use
16 any GPS receivers in the handset.
17 However, it does require some modifications to the
18 handset, largely in the form of software modifications. The
19 other thing that's sort of unique about this method is that
20 it's very GSM specific. In fact, when the original GSM
21 specifications were developed a number of years ago, the
22 founding fathers and mothers of GSM anticipated a need for
23 positioning technology down the line, and they realized that
24 there were certain hooks that already existed in the
25 technology that could be used for positioning and they

1 conceptualized this particular method as a solution for
2 that. Next slide, please.
3 So what is it about GSM that lends itself to this
4 particular positioning technology? I'm going to give a 30
5 second overview of how GSM works for those of you that may
6 be unfamiliar. Well, GSM network, unlike some other digital
7 cellular networks, is unsynchronized. We mean that the base
8 stations transmit within a frame structure that is known
9 only to the base station itself.
10 However, for mobile to make a call, every mobile
11 needs to be aligned with a particular base station's frame
12 structure. The base station is going to be carrying that
13 call. So to facilitate that synchronization, the base
14 stations regularly emit a synchronization burst. And all
15 mobiles will monitor the synchronization bursts of not only
16 their own serving cell with which they will align their
17 internal clock, but also all the neighbor cells in the
18 surrounding area. We call this presynchronization.
19 So the mobile basically all the time has knowledge
20 of the time differences between the base station that it's
21 being served by and all the surrounding base stations. And
22 this is what we're really leveraging in the E-OTD method.
23 And we're building on this capability and extending it to do
24 positioning. This makes E-OTD a very elegant solution and
25 simplifies the installation costs, implementation costs and

1 hardware and software required to achieve the FCC mandate.
2 And I'll explain more about this as we go on. Next slide,
3 please.
4 So how E-OTD works, it's very similar to the
5 network-based methods that we've already talked about today,
6 except it operates in the reverse. Instead of making
7 measurements on the uplink, we are making measurements now
8 on the down link. The mobile itself is making the
9 measurements of the arrival time of bursts from each of its
10 neighboring base stations in addition to its serving base
11 station. The mobile then reports those arrival times back
12 to the network and the network can use that information to
13 triangulate position.
14 But to do this, it needs three things. The
15 coordinates of the base stations, the arrival time of each
16 bursts that are reported from the mobile itself, and
17 finally, the timing differences or timing offsets between
18 all the base stations, because remember, the network is
19 unsynchronized. We obviously know the first bit of
20 information and the second two are what we need to implement
21 hardware and software to obtain. Next slide, please.
22 Some of you talk about what kind of hardware and
23 software we have to implement at our base stations to make
24 this work. And for a carrier, we can talk about pure
25 technology issues. To some extent, the thing that really

1 makes or breaks our ability to be compliant are the really
2 very practical and sometimes mundane implementation issues.
3 You can see from this slide a kind of a block
4 diagram of the hardware that's needed at the base station.
5 There are several ways to actually accomplish the task that
6 needs to be done here, but this is one particular
7 implementation. Remember that what we need from the base
8 station is knowledge of the absolute time of transmission of
9 the burst from the base station.
10 So essentially what I have is a mobile that notes
11 the transmission of the bursts and the GPS receiver which
12 can then be used to time stamp that burst with an absolute
13 time reference. That same note in the box can then transmit
14 that information back to the network via the base station
15 with which it is co-located.
16 Now, from a carrier's point of view, this is
17 really attractive, because it facilitates a very rapid and
18 very efficient implementation of this outside hardware. We
19 don't have to actually add any additional antennas, lines or
20 feeders, which would be very costly and very time consuming
21 as we'd have to reinforce structures, negotiate with
22 landlords or perhaps even build new structures. We also
23 don't need to impede on our existing radio infrastructure,
24 namely the lines and antennas, which are for most operators,
25 the Achilles heel of their network. And we don't need to

1 incur any performance degradation on those links, which
2 could potentially impact the voice performance of our
3 network.
4 So it's quite important to us to consider these
5 issues. Next slide, please.
6 On the handset side, for the implementation, again
7 remember that this a pretty elegant solution. We're
8 building on something that the handset already does and
9 we're extending it. And what we need to, essentially, is
10 make the measurement more precise. So because of already
11 making these measurements, I don't need to change the
12 physical hardware of the phone. I don't need to change the
13 antenna structure and I don't need to change the DSP or RF
14 hardware, because the phone is already making these types of
15 measurements. Well, again, what I do need to do is enhance
16 that measurement. I need to make it more accurate and more
17 precise. And so what I need now is some additional cells on
18 the phone that's going to do three things.
19 First of all, it will employ some more
20 sophisticated multi-path ejection techniques to more
21 efficiently discriminate the line of site component between
22 the base station and the mobile phone and therefore, get the
23 true time delay between the two points.
24 We need to employ some integration techniques to
25 improve the detectability of the burst, and finally, we need

1 to have some software so that the mobile can report that
2 measurement back to the network. Now, let me just say that
3 I picked my handset here because it matches our logo, not as
4 endorsement of any particular vendor. That was a joke.
5 Okay, next slide, please.
6 Okay, another thing that's quite important to us
7 as a vendor -- I'm sorry, as an operator -- is that we want
8 to have a wide variety of manufacturers to select from. E-
9 OTD has been developed in T1P1.5 and the standardization
10 work has been in by major manufacturers and vendors and also
11 operators in the GSM community. So you can see that this
12 list is quite extensive and included several of the major
13 GSM manufacturers.
14 So this is important to me from a carrier, not
15 only for having a choice by view, but because it insures me
16 that I will have options to pick from that are very
17 competitive, have the lowest possible price and also have
18 been driven to the technological limits. That's the end of
19 the slides.
20 In summary, I just want to say that E-OTD for us
21 is a very elegant solution, in that it's building on the
22 existing functionality of the network. The benefits this
23 gives us as an operator is a very elegant and simple
24 installation, fairly rapid installation of the technologies,
25 improve our ability to comply with the FCC Phase II mandate.

1 And because as you can see and as you've seen, the changes
2 and hardware that we need to implement in the network and in
3 the handset are fairly simplistic, and not all that
4 expensive, we can also be assured of a lower cost solution.
5 Thank you very much.
6 MR. HATFIELD: Thank you very much and we'll turn
7 now to the final handset presentation by Integrated Data
8 Communications.
9 MR. PRESTON: Yes, sir, do I get all the rest of
10 the time?
11 MR. HATFIELD: No, no, we'll split it up.
12 (Laughter.)
13 MR. PRESTON: I'm Dan Preston, chief technical
14 officer of IDC. We're in a place called Bainbridge Island,
15 Washington, which is about six miles due west of the Space
16 Needle. It's appropriate that I'm last, because we're
17 actually an L Commerce business. I need to explain that a
18 little bit. We're in the commercial public safety business,
19 web applications, things like that.
20 I took a unique approach about two years ago to
21 solve this problem. We could only deal with the tools that
22 we had at that particular time to solve this problem for
23 public safety and the thing that I had rented was, at ten
24 cents a minute, was the call pack or the voice channel. We
25 drew up protocols that were basically, that are networking

1 dependent, and transmitted data within the call pack.

2 It's a handset based solution. We supported GPS -

3 - I guess we lost our slides -- there we go. We supported

4 GPS during the trial and at the King County last year. We

5 support any satellite position type technology. We also

6 support any other type of technology, where the XY can be

7 driven out to the handset, or it can be generated to

8 handset.

9 We did a trial in Seattle, King County, Seattle,

10 and I'm sure that by now, many folks in the audience have

11 seen the results of the trial. We did it to satisfy public

12 safety. The folks at public safety, we sat down with them

13 and asked, how would you guys like to really solve this?

14 And they sat with us for some months, talking about

15 technology, the capability of the technology, and what we

16 thought we could do.

17 Back up to the first concept of L Commerce, we're

18 developing products now for fourth quarter '99 release. We

19 don't need the wireless carrier's infrastructure to be

20 changed to make our solution work. Next slide.

21 Basically, when I looked at the problem, the

22 question was, how could I make the wireless carrier look

23 like part of the LEC or part of the public switch telephone

24 network? How could I make the wireless carrier, or how

25 could I make the wireless handset look like an extension of

1 the LEC or look like an extension of the call taker? And
2 again, it was a call path method. Call path is not an
3 unusual method, CAMA signalling, Feature Group B signalling
4 has been around for many years. Next slide.
5 The folks in Seattle in public safety were
6 concerned about real test, real venues, real call takers,
7 real trunks, real vendors. We went out, we put together
8 this public safety trial and we forced canopy -- that was
9 like double, triple canopy inside Seattle. Urban canyons --
10 if you folks haven't been up to Seattle recently, we've got
11 lots of seven-story buildings, albeit lead on the outside,
12 quite a bit of the time -- suburban and mountains. Next
13 slide.
14 We did a six-month trial with King County. We
15 actually sat down and brought together all of the incumbent
16 facility and all of the incumbent facility providers, the
17 folks from SCC, who do the standard alley type work and so
18 on. Marla said, though -- Marla Davis is the King County E-
19 911 director -- and she said that 125 meters was a good try,
20 but she wanted to know if we could get it down to 40 feet.
21 She wanted to know if we could route calls to the
22 appropriate PSAPs. Could we refresh the data in band, or
23 could we refresh the data? Could we find 90 percent of all
24 the callers? Could we integrate this in three real PSAPs,
25 which are call takers? And that she would provide to us

1 cooperation from the land line carriers, vendors and public
2 safety.
3 The mantra of what we did was, if we could satisfy
4 public safety, we had a hell of a commercial business. So
5 we set about trying to basically raise the bar on public
6 safety and then create this public business. Next slide.
7 The good news we found 100 percent of the callers.
8 Now, these are 100 percent of the location-enabled handsets,
9 and we had 30 handsets for this particular trial. I've
10 spent a lot of time talking to the FCC about how do I
11 present the data. There were three ways to present it. The
12 least conservative method here was to give you the raw data.
13 A next lesser conservative measure would be to do some RSM
14 averaging and finally some CEP-type averaging.
15 The good news is we found 100 percent of callers -
16 - when I talked to Marla Davis, approximately 48 percent of
17 her calls come from rural highways and things like that.
18 And I believe that in that area, we found basically 48
19 percent of her calls at less than 70 feet. Now, this was an
20 early generation GPS-type system. Next slide.
21 The other issue public safety had was, we couldn't
22 solve this with just one handset, one technology. In the
23 upper corner here, in the upper left corner, there are
24 basically a description of the different handsets that we
25 use in the trial. In the lower corner is the error

1 interfaces that we used during the trial. CDMA is
2 disproportionately large for a couple of reasons. One was,
3 it was for us, one of the easiest mediums to get data
4 across. And two, GTE Wireless provided the support from
5 their switch, so we do all of our routing on the GTE
6 network. Next slide.
7 What's driving location technology? A funny thing
8 happened on the way to the FCC. Commercial public safety
9 rose to the surface. What I mean by that was, because we're
10 in the call path, there are commercial type applications,
11 road assistance, personal security, telematics, that we can
12 transmit data on and enable today.
13 Commercial concierge type services, AVL, asset
14 tracking, commercial applications view of the Internet,
15 panic buttons, phone finders or family finders or so on. I
16 think the important thing the FCC needs to know is that call
17 centers and hosting infrastructure are being built today for
18 this demand. There are a number of groups that are doing
19 this. I can't discuss -- we'll hear later this summer, but
20 this is coming to fruition and hopefully by the end of this
21 year, you'll be able to get these kinds of services. Next
22 slide.
23 We come into this trial, one of the questions
24 we're asked is, what's the state of GPS technology? And
25 you've heard from all the handset makers here ahead of us or

1 handset providers. One thing we found was GPS technology is
2 evolving rapidly. We went into this trial and rephrased the
3 product that we tested with and by the end of the trial, we
4 found a marked improvement, 245 percent better with later
5 versions of the Sirf Technology.
6 Commercial products, again, are months away. The
7 commercial goal, as you heard from Kanwar, wireless coverage
8 should be available wherever, or rather, locations should be
9 available wherever the wireless coverage is available.
10 Approach works, one other issue that wasn't talked on a lot
11 about and that's the right to privacy. One of the issues is
12 with any handset-based solution, you can shut it off. You
13 can disable it like caller blocking.
14 Finally, I'd like to thank you for the opportunity
15 to present this. IDC would like to be considered amongst
16 the players in this public safety arena. We're here now and
17 we're not going to go away. Thanks.
18 MR. HATFIELD: Thank you very much, and then, as I
19 started to say before, we do have a few minutes, so I will
20 start back at the right hand side and maybe about a minute
21 for each, any final wrap up comments.
22 DR. HILSENRATH: An hour worth of comments. It is
23 primarily around the maturity. I think that we're looking -
24 - it should be obvious after these presentations -- we're
25 looking at two types of technologists around the table.

1 We're looking at one type of technologist to have a very
2 simple and straightforward avenue of relocating. By that,
3 we're looking at another technology, equally interesting,
4 with a major launch issue out there, which is how to get
5 this technology into the hands of tens of million
6 subscribers. I think that it's quintessential to the
7 discussion around the table here. Not only how innovative
8 the technology is, but how simple is the vehicle of
9 delivering it into a mass, horizontal, type of market.
10 MR. HATFIELD: Thank you. KSI?
11 MR. MALONEY: I provided my summary earlier. I'll
12 just restate it. With the infrastructure approach, location
13 technology is here today to do real time call routing and
14 all requirements for all phones, those that exist and our in
15 your hands right now and any that will occur in the future.
16 MR. HATFIELD: You probably should identify
17 yourself for the record.
18 MR. KAHAN: Hi, my name is Dennis Kahan with
19 SigmaOne. I'll say something that might sound out of
20 context. I don't really think the issue is technology at
21 all. Five years ago, the FCC had a wonderful idea to how
22 you save lives and how you protect people from serious
23 injury. They set a date of October, 2001.
24 That date for many reasons has slipped, and now
25 the FCC is considering the possibility of letting it slip

1 more. There are 70 million handsets out there that don't
2 have GPS capability or E-OTD capability. They can be
3 located. You must create an environment in which all
4 handsets will be located.
5 MR. STILP: Lou Stilp from TruePosition. I feel
6 like I wouldn't be here if the question hadn't been raised
7 over a year ago about whether handsets now can qualify for
8 consideration under 94-102. I'm not sure if I misunderstood
9 Mr. Bell about the test results that have been submitted
10 into the record. I've spent a great deal of time going
11 through test results that are in the record and I guess the
12 things that concern me are there are more than 20 separate
13 tests that are described in here, and not a single mention
14 of what one looks like with an internal antenna.
15 And if that's an internal antenna, I guess I'm
16 still going to keep this phone.
17 It is a very key question, because the sensitivity
18 that network assisted provides is only 14 db and one of the
19 test results that is described in here is that eight db of
20 that is lost in going to internal antenna. There's a chart
21 in here that shows an awful lot of data that simply isn't
22 explained away. Yields below 60 percent, below 80 percent.
23 As a matter of fact, almost a quarter of the test results
24 had a yield of less than 80 percent. That means all these
25 people weren't found or wouldn't have been found. And test

1 results that are way above 90 meters -- which is what's
2 being offered here.
3 So I think we must consider carefully what exactly
4 is being tested and whether those results have any bearing
5 on reality when one talks about the handsets that people
6 want to buy.
7 MR. HATFIELD: Mr. Bell?
8 MR. BELL: Gee, I think I just had to change my
9 one minute here. Let me first say, I think the real issue
10 here on GPS is how to commercialize it in the handsets. Our
11 cost estimates that we're being told for first generation
12 integrated implementations are in the $7 to $10 range. The
13 incremental cost to the handset. That includes antenna,
14 that includes licensing, and we're being told that will drop
15 dramatically as law gets applied. These are standard
16 processing elements.
17 And to that end, my last slide, which I ran out of
18 time on, we have both equity partnerships and license
19 agreements with Motorola and TI, who combined to provide a
20 large majority of the global wireless components. And the
21 real key here is that this is going to be put into those
22 handsets so that it's available to everybody. It's being
23 driven down and it will be included as a standard feature as
24 handsets get deployed, going forward.
25 And then, finally, relative to the test results,

1 I'm not sure which public release of our test results are
2 being referred to. We have release to the FCC and the
3 document package it received last week. Great detail on our
4 test results. Most of what's on the stack here, and we'd be
5 glad to respond to questions from the FCC on those results.
6 MR. HATFIELD: Mr. Chadha?
7 MR. CHADHA: I think --
8 MR. HATFIELD: Could you identify yourself?
9 MR. CHADHA: Yes, my name is Kanwar Chadha from
10 Sirf Technology. I think the question here is we are
11 looking at that technology investment and infrastructure
12 investment, looking five to ten years ahead and we have to
13 look at what is the technology best for the future, not
14 necessarily the technology best in the past.
15 I come from the computer industry and in the early
16 80s, mainframes were a proven technology, and if we had
17 invested more in them, I think the PC revolution would not
18 have happened. Five years back, amps was a proven
19 technology, and as the rest of the world has proven, going
20 to digital in the long run was a much better choice. So I
21 think we have to look at not necessarily where the
22 technology is today, we have to look at where it's going to
23 be five to ten years from now.
24 As SnapTrack as mentioned, they have aligned up
25 with a number of semiconductor vendors. Sirf has aligned up

1 with Nokia and Ericsson, which are the major suppliers of
2 digital handsets, at least. So I think in the future, the
3 location technology is going to be part of the handsets, and
4 the costs will be taken care of using the most -- we have to
5 see what is the best technology for the future.
6 MS. FRASCO: I'm Beth Frasco from Aerial
7 Communications. I'd just like to say that I think that the
8 FCC had a very successful history of converting competitive
9 and technological neutrality and I think that the same
10 lessons apply here.
11 I think that as my colleague to my left mentioned,
12 we need to mindful of not only what the current capabilities
13 are, but what the future capabilities are, as well. We're
14 going to be making decisions here that are going to affect
15 the industry for a long time to come. We're also leaders,
16 when you look at the world wide stage on this particular
17 technology. I'd like to see the FCC, notwithstanding all
18 the comments that have been made here today, take a position
19 that does encourage development in the positioning
20 technologies and in the locationing site of our industry.
21 And I think that allowing the maximum number of options to
22 carriers will allow that, and, whether they be handset based
23 or network based. And I think that the market and the
24 capabilities and the technologies will be proven in good
25 time. Thank you.

1 MR. PRESTON: Dan Preston with IDC. I agree with
2 Beth. Our goal was to come here as one of the late comers
3 in the game and to demonstrate a delivery capability that
4 was consistent with the needs of public safety and within
5 the cost recovery, current cost recovery bounds and so on.
6 We've seen a marked improvement in the technology and I
7 reiterate what she says is, what we're really looking for
8 is, let's make sure we clearly define the requirements for
9 either network based or handset based, and let the markets
10 decide, let the wireless carriers decide which brand they
11 want to buy. Thank you.
12 MR. HATFIELD: Okay, thank you. I think we'll
13 wrap up here and start our break at this point. And since
14 we're breaking a little bit early, I think we can come back
15 right at 3:15 sharp and start the discussion part of the
16 agenda. Thank you.
17 (Whereupon, a short recess was taken.)
18 MR. HATFIELD: Okay, if we can get started again,
19 please? If we can have our panelists gathered, we can get
20 started, please? Okay, do we have everybody up front? If
21 we can get started, we're now into the discussion phase of
22 the round table, and what I'd like to do, we have a lot of
23 people up here at the table. Now, what I'd like to do is
24 start out by just going around the table and having each
25 person just identify themselves and their affiliation and

1 then after that, we'll actually start then, beginning with a
2 question from the Commission staff people upfront. And just
3 arrived is Tom Sugrue, whom I'm sure most of you know is
4 chief of our Wireless Telecommunications Bureau.
5 MR. SUGRUE: I'm Tom Sugrue from the Wireless
6 Bureau.
7 MR. SCHLICHTING: I'm Jim Schlichting, deputy
8 chief, Wireless Bureau.
9 MR. NETRO: I'm Ron Netro, engineering, the Policy
10 Division.
11 MR. HANNA: I'm Joe Hanna with the City of
12 Richardson and the President-Elect of APCO International.
13 MR. MILLER: I'm Bob Miller, technical issues
14 director for NENA.
15 DR. BIRCHLER: Mark Birchler of Motorola Labs.
16 MR. CEDERVALL: Mats Cedervall from Ericsson
17 Research.
18 MS. SILLANPAA: Anna Sillanpaa, Nokia.
19 MR. SMITH: Tony Smith from Nortel Networks.
20 MR. SOLIMAN: Samir Soliman, vice president of
21 technology, QUALCOMM.
22 DR. HILSENRATH: Oliver Hilsenrath, U.S. Wireless.
23 MR. MALONEY: John Maloney, KSI.
24 MR. KAHAN: Dennis Kahan, SigmaOne.
25 MR. STILP: Lou Stilp, TruePosition.

1 MR. BELL: Walter Bell, SnapTrack.

2 MR. CHADHA: Kanwar Chadha, Sirf Technology.

3 MS. FRASCO: Beth Frasco, Aerial Communications.

4 MR. PRESTON: Dan Preston, IDC.

5 MR. SRINIVASIAH: Bhaskar Srinivasiah from GTE

6 Wireless.

7 MR. RUDOKAS: Ron Rudokas, Western Wireless.

8 MR. O'LEARY: Eamon O'Leary, AT&T Wireless.

9 MR. NIXON: Jim Nixon, Omnipoint.

10 MR. MONTGOMERY: Bob Montgomery, Nextel.

11 MR. CHADNEY: Tony Chadney, AirTouch.

12 MR. ECKERT: Bob Eckert, FCC.

13 MR. KNAPP: Julius Knapp, FCC, Office of

14 Engineering and Technology.

15 MR. HATFIELD: Okay, I'd like to start by thanking

16 the additional people for attending and participating today.

17 And I'll turn to my right in terms of first question. Jim,

18 did you have a question, Tom, or did you want to start off?

19 MR. SUGRUE: Well, I'll just pass over to Jim, let

20 me just say since I missed the first half and Dale may have

21 done the thank you and all, but I'm just honored to be at a

22 table with all this talent and intelligence. This is a

23 great treat for us and look forward to learning something

24 about these technologies, more about these technologies.

25 It would help me, particularly in this part of the

1 session, not to stimulate arguments or unconstructive
2 dialogue, but one of the parts so people can -- if you hear
3 something said that you think is just out of bounds, pick up
4 on it, or isn't quite accurate. Because, one of the
5 motivations for having this session was just in trying to
6 sort out maybe the various claims as to how these
7 technologies work and how they're working, and a fairly
8 universal theme from some of the users -- I spoke to
9 carriers in the public safety community, which is, to us,
10 all the technology advocates are advocates and, to some
11 extent, are overselling the current capabilities of their
12 systems.
13 Now, technology advocates are advocates, we
14 realize that. So where we're hearing these various
15 different things and we're trying to get a better handle on
16 it myself, so, again, thank you all for being here and I
17 look forward to a stimulating afternoon.
18 MR. HATFIELD: Jim?
19 MR. SCHLICHTING: I figured a good first question
20 might be whether the sort of other folks other than the
21 panelists who have joined us around the table this afternoon
22 are familiar with sort of alternative approaches like I know
23 there was mention of a hybrid approach during the earlier
24 session this afternoon. There was also a reference to
25 another hybrid systems and the like, and figured that maybe

1 a good initial question would be from sort of anybody around
2 the table as to whether there's any other systems that we
3 ought to be putting on the table a short description and the
4 like, for purposes of discussion?
5 MR. HATFIELD: Please identify yourself, since
6 we're sending this out over the Internet?
7 MR. SOLIMAN: This is Samir Soliman from QUALCOMM.
8 It has been pointed out that there are some drawbacks to
9 both approaches, the network approach and the handset GPS
10 assisted approach. But if you look at where each one of
11 these technologies failed, they complement each other very
12 well.
13 In areas where GPS has some problems, the network
14 solution works very well. In areas where the network
15 solution fails to deliver, GPS solutions works very well.
16 QUALCOMM is promoting the hybrid approach, where we fuse
17 measurement from the GPS constellation with measurement from
18 the network side. By measurement from the network side, we
19 mean forward link measurements done by the handset and
20 reverse link measurements or uplink measurements done by the
21 base station.
22 The three pieces of information, measurement from
23 the GPS constellation, measurement from the phone,
24 measurement from the base station, are fused together to be
25 used the best possible measurement or best possible

1 position.

2 MR. HATFIELD: Thank you. I think one of the

3 major issue areas we have to talk about is location accuracy

4 and so, if it's okay, I think we'd like to focus our

5 attention in that area for a few minutes.

6 MR. KNAPP: Thank you, Dale. One of the questions

7 that I was wondering about as we heard the presentations is

8 there were a lot of claims made about accuracy. To try to

9 get a better understanding about the measurements of

10 accuracy and whether those were taken under conditions of

11 actual use or with the phone isolated. So as a starting

12 point to some of the proponents, if you could just comment

13 on how they obtain the accuracy information?

14 MR. MALONEY: I'll start. My name is John Maloney

15 from KSI. All of the results that we published in the

16 record over the years for 94-102 docket are just normal,

17 cellular operations in the areas where we've been processing

18 the signals. So nothing has been done to particularly, say,

19 enhance the characteristics of the signals, no power spiking

20 or anything of that nature. They're just normal operations.

21 So that's the conditions under which we have operated.

22 MR. KNAPP: All the 600 millowatt handsets?

23 MR. MALONEY: Well, no, matter of fact, back in

24 1990 when we started, we were using three watts, whatever.

25 The small little phones didn't come along till later, but

1 yes, all the recent results have been with six watt phones.
2 They've been TDMA as well as amps. We're, as I mentioned
3 earlier, still in the process of implementing CDMA, but
4 others have done CDMA and perhaps they can comment.
5 MR. KAHAN: That is true. We also -- and for amps
6 and it may go down to six millowatts, as opposed to 600
7 millowatts, and we're doing tracking there, as well. And
8 I'm sure that the same is true for the network providers,
9 which don't really need to change the phones to do their
10 tests.
11 MR. HATFIELD: One question, one thing was
12 inherent, I think, in Julius' question, was the handset used
13 in sort of a normal position? You know, and that sort of
14 thing, it wasn't set --
15 MR. KAHAN: Completely normal.
16 MR. MALONEY: I might offer that he mentioned six
17 tenths watt or whatever. Turns out, when you use very old
18 phones or on the amps, they can't powered below the lowest
19 level power, so right now, even the phones that can go up to
20 zero and one don't do it anymore. The systems are
21 programmed not to command anything above level two. So
22 we're all down at 6/10 watts nowadays.
23 MR. STILP: In addition to what the others had
24 mentioned, TruePosition uses a fairly large number. In the
25 case of Houston, for example, there are in excess of 600

1 what we call ground truth spots, spaced, perhaps, every
2 couple tenths of a mile down roads. And so, when a location
3 is made on a standard phone and everything that Dennis and
4 John and Oliver said apply to us as well, we use standard
5 phones in all kind of positions, it's then compared
6 against -- that is, the location estimate is then compared
7 against known ground truth to determine what the accuracy
8 is.
9 MR. HATFIELD: Other comments?
10 MR. BELL: Yeah, in the report that we've released
11 to the FCC, which contains all of the details of our test
12 reports, we're very clear to specify the handset position as
13 well as the type of antenna used. And in the Tampa test, we
14 did a substantial number of the tests with those small
15 prototype antennas that could be commercialized being held
16 up in a normal usage situation up next to the head. We
17 agree with you that that is a very important parameter to
18 the test.
19 MR. HATFIELD: So let me make sure that everybody
20 we've heard from so far then uses it in a sort of normal
21 operating position, is that right? Is my understanding
22 correct?
23 MR. STILP: Yes, I get the distinction that ought
24 to be made, that some frequencies like GPS are sensitive to
25 how close one is to the body. At frequencies, which are at

1 much higher powers, transmitting at 600 millowatts, versus
2 on the order of negative 140, negative 150 DPM for GPS.
3 Once you're inside the vehicle, I think most people
4 acknowledge there's approximately seven to ten, according to
5 Dr. Birchler, there's approximately seven to ten DB loss in
6 the car, almost no matter where the phone is in the car.
7 That's about right?
8 DR. BIRCHLER: Generally.
9 MR. STILP: So you assume even less? So phone
10 position has less meaning in network type of testing, quite
11 honestly.
12 MR. BELL: I'm actually not sure I agree with
13 that. I think attenuation is attenuation. RF is RF. GPS
14 falls between the PCS band and the cellular band, so I
15 believe the attenuation factors are similar. GPS -- it's
16 true GPS signals are lower. They're actually below the
17 noise floor and that's why we have such an advance signal
18 processing approach to pull those out of noise. But
19 attenuation is attenuation.
20 MR. HATFIELD: Yes, do you want to continue down
21 the line?
22 MR. CHADHA: We haven't published any data to
23 assist as yet, but some of our partners have done testing
24 with GPS and handsets, and sort of standard environment, and
25 I agree with Walt that attenuation is going to be there,

1 whether it's a GPS signal or wireless signal. In some
2 cases, you know, you will have issues when you are indoors
3 or inside a car, both signals are going to have some
4 signals. But that's normal nature of the RF technology.
5 MR. HATFIELD: Was there a response, further
6 comment?
7 DR. HILSENRATH: Just to further the issue of
8 measurement and some additional comment that I have. Yes,
9 wireless is actually looking at quite the substantial
10 investment that was made in referencing test data. Maybe
11 because of the fact that we're using calibration as part of
12 our training on the system, this is particularly important.
13 We have made an investment of a mix of GPS,
14 differential GPS dead reckoning and in some cases satellite
15 differential, in order to make sure that we have the
16 reference information we need in the cities, in the
17 downtowns, where GPS, we found out that commercial GPS has
18 major problems.
19 So we're using the reference that is very accurate
20 and is also post-processed for the reference of our testing.
21 I think that one of the major issues that refers to your
22 question, Dale, of how the phone is being used, there's a
23 fundamental difference between the network solutions and the
24 GPS, in the sense that as long as your call arrives to the
25 base station, typically a good network solution should be

1 able to locate it. It's the same channel.

2 The issue of if the call is attenuating five db's

3 or 10 db or 15 db, as long as your call arrives to the base

4 station, you should be able to be located.

5 In the GPS case, you're talking about two disjunct

6 processes. One is your call that needs to get to the base

7 station. Secondly, the GPS acquisition has to be right in

8 order to be able to pass on the location to whatever service

9 you're using. So we're talking about two different

10 processes. I doubt that any of the network solutions are

11 affected by the way the handset is being held or if it's on

12 the passenger seat or held upright near the ear of the user.

13 It's important to identify that through GPS, we're

14 introducing a separate, totally independent process with its

15 own datalink and link budget problem.

16 MR. HATFIELD: Could you identify yourself? I'm

17 sorry.

18 MR. SOLIMAN: Samir Soliman from QUALCOMM. To

19 continue with the test -- we do testing in two of the user

20 models. One of them, when the user holds the handset in a

21 dialing position, because we expect to get the position

22 before the call is set up, completely set up, and we also

23 use the user model when the user holds the handset close t

24 his ear, because we believe that there is impact between the

25 body and the antenna.

1 In both situations, we noticed they raise a
2 degradation due to the antenna, relative to the free space
3 propagation, but distance signal processing that will be
4 done on the GPS signal can enhance and help mitigate the
5 degradation that goes by the antenna body interaction.
6 MR. HATFIELD: Yes.
7 MR. CROSTER: I'm Norm Croster, SnapTrack, and
8 there was a statement just made that body blockage and other
9 effects will have minimal effect on network overlay type
10 operation. And I think the statement may possibly be true
11 in my view for a single base station, such as what U.S.
12 Wireless is proposing. But if you're talking about multiple
13 base stations receiving a single signal, I think body
14 blockage and location will, may very well or greatly
15 deteriorate the signal levels at one or more of those base
16 stations, thereby greatly reducing availability.
17 I'm not sure there's been a significant study in
18 order to assess this, but it's pretty clear that as you're
19 moving around, the, you know, the signal level in different
20 directions -- unless -- signal level in different directions
21 are going to vary perhaps very dramatically. So I mean,
22 there really needs to be quite a bit of testing to, I think
23 validate the claims that were just made.
24 Now, it may be the case that for the U.S. Wireless
25 system, with a single receiver that, in fact, you can do a

1 position fix whenever you can get a, whenever you can get a
2 communication in terms of the availability and the accuracy
3 of that approach. That's a whole new set of circumstances
4 that are quite different from the other triangulation
5 approaches, so I think that statement was a little bit --
6 greatly overstated in terms of the ability of network
7 systems to be able to handle degradations associated with
8 body blockage or locations. I just don't think that can be
9 supported in fact.
10 MR. STILP: Lou Stilp from TruePosition. I'm not
11 sure how long you want this debate to continue, but I can
12 tell you that there has been extensive amount of testing --
13 something on the order of four to five million location
14 records is not insignificant.
15 In calculating a location solution, TruePosition
16 is one example of a system. It goes out to as many as 190
17 different antennas in the system, in which to sample signals
18 and find out which antennas had the best view of where the
19 caller was. And so, even if some of what Mr. Croster said
20 were true and that the blockage would cause lack of signal
21 at one particular antenna, there are certainly a very large
22 selection of additional antennas from which to choose from,
23 to make every location solution possible.
24 MR. HATFIELD: Juli, do you want to follow up?
25 Sorry --

1 MR. ECKERT: I'd like to draw attention -- Bob
2 Eckert here with OET. I'd like to draw attention to the
3 comments on yield and I'd like to hear, actually, we didn't
4 hear from Mr. Preston or Ms. Frasco on whether their tests
5 are done in real situations? And so, it's this yield that
6 I'm concerned about.
7 Mr. Chadha talked about operating in a hot mode,
8 and if that affects yield as opposed to accuracy, then it
9 matters, it seems to me, whether you're in real situations
10 or test situations.
11 MS. FRASCO: Well, again, because E-OTD is
12 somewhat different from our better handset based
13 technologies in that it doesn't use GPS, the debate that
14 we've been having over exact locations of the handset during
15 test methods are not quite as critical. Because, it's
16 what's happening in the uplink and downlink are pretty
17 bidirectional.
18 But I can't say that the test results and the
19 trials that other manufacturers that I know of did you use
20 handsets in real user environments and real user situations
21 and used commercial-type handsets.
22 MR. PRESTON: Dan Preston from IDC. In the trial
23 in Seattle, we made about 20,000 calls and these were from
24 very real locations, buildings, in buildings, tunnels, under
25 forced canopy. The antenna placement was exterior from the

1 device. That was done very deliberately.

2 One of the issues that we looked at early on was

3 trying to capture variables in the system. We found that

4 the mapping systems available -- even the good mapping

5 systems available -- had error up to 400 feet. We went in

6 and did differential GPS drives, centerline drives and

7 corrected Seattle, Mercer Island, Northbend and so on. And

8 in an attempt to reduce all of the error in the system, what

9 we found at the end of the test, what we didn't want, was

10 somebody saying we really like the GPS solution, but you're

11 404 feet off to the northwest all the time, and that's

12 because the maps weren't good.

13 The benchmarks that we went to were GPS

14 differentially corrected to two centimeters and we used

15 these 92 benchmarks in downtown Seattle, so the results we

16 got were pure results. Since the trial, we have tested a

17 product from a company out of England called Symetricom. I

18 think the gentleman from SnapTrack also tried it. I believe

19 it's a product that is evolving and will have -- the issue

20 is called SAR, Selective Absorption Rates on tissue, and

21 this one apparently has some of the best characteristics.

22 Again, I think the gentlemen from SnapTrack have tested it

23 more extensively than us.

24 For us, the point was that the technology was

25 evolving to catch up to some of the need.

1 MR. HATFIELD: I'm not sure you responded to Bob's
2 question regarding yield. Could you do that?
3 MR. PRESTON: The yield, with respect to the
4 number of calls?
5 MR. ECKERT: Yes, the percentage where you got a
6 position fix?
7 MR. PRESTON: Oh, 100 percent of the calls
8 obtained the position fix. Ninety-four percent of the calls
9 were within the 410, 125 meters. We reported to you all of
10 the, there were 470 locations that were controlled and we
11 reported to the FCC, to King County Public Safety, all of
12 the data. We didn't throw out the top 10 percent nor did we
13 average it back. We felt that the best way to present the
14 data.
15 MR. HATFIELD: Can we get some other comments on
16 this question of yield? Yes?
17 MR. SOLIMAN: Samir Soliman from QUALCOMM. I'd
18 like to make a comment regarding accuracy. First, the
19 communication signal being used for both cellular and PCS
20 are designed for a two-way communication system, not
21 designed for ranging. Ranging signals needs to have a sharp
22 edge in time in order to complete exact position. Having a
23 sharp edge in time means huge band width that really goes
24 against designing a communication system. And there is some
25 from the mental, theoretical limits on how accurate you can

1 get with any designed communication system. The band width
2 that is designed so that the signal does not interfere with
3 the co-channels limit how accurate you can get with any
4 existing communication signal.
5 MR. HATFIELD: Others?
6 MR. CHADHA: This is Kanwar Chadha, Sirf
7 Technology. Some of the tests we have done in open
8 environment, typically, we get about 95 percent of the time
9 what we call 3D fix, which means we are seeing four
10 satellites or more. And yield is typically between 99 and
11 100 percent, but this is an open canyon environment. The
12 yield will be affected when you go indoors, and that's a
13 function of how indoors you go.
14 And I think one of the things we have to keep in
15 mind is trying to guarantee 100 percent yield with a
16 wireless environment is, to a certain extent, dreaming. I
17 mean, I have a cell phone here and it says, "No service."
18 So I mean, yield is a function of how strong the signal is,
19 where you are in the building and how good the coverage is.
20 Sometimes you will see GPS may get the location, but the
21 wireless link is not there. So we have to look at the
22 statistics of where those emergency calls are really made
23 with a wireless phone. They're not inside buildings,
24 typically. They're more outside, and GPS is a pretty
25 reliable technology, most of the time.

1 MR. HATFIELD: Yes, some more comments?

2 DR. BIRCHLER: Mark Birchler from Motorola. A
3 couple of points. I think one important thing to keep in
4 mind when we're talking about yield for E-911 is we should
5 be talking about probability of location coverage, given
6 that we have voice coverage. In other words, it doesn't do
7 you much good to have location if you don't have
8 connectivity to the wireless system, so it should be a
9 conditional type of parameter.

10 The second thing is that I think we can all agree
11 that there's no location system that's going to give 100
12 percent yield. As it was pointed out in this room, there's
13 no cellular coverage, if a site was added that gave us voice
14 coverage in this room, that you'd have to add two or three
15 more sites to get, perhaps, location coverage.

16 Now, I understand that location technology can be
17 far more sensitive than the voice systems, also, so you have
18 to factor that in. But we shouldn't imagine that any
19 location technology is going to be capable of 100 percent
20 yield, and this does affect, given the RNS definition, could
21 impact the ability of the industry to comply with field
22 location and accuracy.

23 MR. HATFIELD: Let's continue around, please?

24 MR. RUDOKAS: Ron Rudokas from Western Wireless.
25 I guess I'd like to try to address this issue of yield and

1 accuracy from a slightly different point of view. As an
2 operator -- and, I might add, the only rural operator that's
3 here, we like to think of the world from the standpoint of
4 our customer, and our customer in this case would probably
5 have the perception that if he can make a phone call, he can
6 be located.
7 So if I look at what's going on here and I believe
8 that all the people at this table are honest individuals, we
9 have no solution or we all have solutions, there are many
10 solutions to this problem, one way or the other. But it
11 looks like every one of these solutions has a lot of caveats
12 from the standpoint of calibration, use of multiple sites,
13 problems with in building coverage, costs, rooming and new
14 handsets.
15 So the issue, I think, is to kind of look at the
16 intent of the E-911 ruling and what it was supposed to do
17 for our customers or for the population in general. So I'd
18 like to focus on the ruling and the way the operators would
19 comply with the ruling and ask two questions along that
20 standpoint. And one of the questions for me when I look at
21 what's going on here, I do not have a way of knowing whether
22 or not I have actually complied to either the intent or the
23 letter of the E-911 ruling. There's really not enough
24 definition in the ruling for me to understand if I've met my
25 goal.

1 The other one is, even if I have met my goal to
2 comply with the ruling on some particular test day, what
3 happens to me as an operator on some subsequent day when
4 issues such as self-site maintenance, flood, or maybe a lot
5 of calls from an area that is previously unrecognized as a
6 bad service area make it impossible to meet that particular
7 specification that particular day? And I'll be happy to
8 hear anybody's response.
9 MR. HATFIELD: Any further comment on this
10 particular issue of compliance?
11 MR. PRESTON: Dan Preston with IDC. One of the
12 things we did do at King County's request was to drive
13 through, basically, a single tower covered corridor, which
14 is I-90 up out of Seattle, to what's called Snoqualmie
15 Summit. And what we saw in this tracking exercise,
16 basically we had only one tower coverage. In fact, I think
17 in some cases we had almost no coverage at the top of the
18 summit, but we were able to make the call.
19 But we were able to generate, or, in this case,
20 yield data, location data, for that, oh, probably, 35 mile
21 trek. The county over from us is a rural county like this
22 gentleman speaks to. And he says 95 percent of his calls
23 come from the top of Snoqualmie Summit, east out into the
24 prairie. And he thinks he's got only single tower coverage
25 the entire way.

1 A GPS or a handset based solution supports those
2 sorts of rural needs very well, and that's a large part of
3 America.
4 MR. RUDOKAS: I'd like to respond to that
5 particular comment. Although we are, indeed, a rural
6 carrier, one of the things, my guess is that your rural
7 carrier that you were dealing with has the same issue, is
8 that we have the same sorts of demands for our service as an
9 urban carrier, and we do end up using a lot of repeaters and
10 enhancers to provide coverage inside a building, shopping
11 malls, mine shafts, tunnels, that sort of thing.
12 So what I guess I'm trying to focus on is a little
13 bit of addressing the issues of this mandate in the FCC
14 ruling which doesn't specify that we all be driving around
15 in vehicles. Because, indeed, we have people who use their
16 phones in buildings, although not in this building,
17 apparently.
18 (Laughter.)
19 MR. RUDOKAS: But there is a fair amount of that
20 kind of an issue that we need to deal with, which makes GPS
21 very difficult. But there's some orthogonality here in
22 terms of solutions.
23 MR. STILP: Lou Stilp, TruePosition. I'm not sure
24 Mr. Eckert's question is being fully answered, at least from
25 where I sit here. Yield, in particular for handset

1 solutions, is very tied to the antenna. Motorola published
2 a paper that I think everyone has seen or is familiar with,
3 last summer, that showed a very wide performance when it
4 came to the type of antenna and where it was integrated into
5 the phone. And the Tampa results, and I can only go off of
6 the ex partes that are public here, that that's an inclusion
7 even out of Tampa, is that small, handset ties antenna
8 performance was comparable to larger GPS antennas only under
9 open sky conditions.
10 And when one goes through the results, there is
11 clearly a very wide variance in what percentage of location
12 attempts were actually successful, based upon what kind of
13 antenna was plugged into the phone. And again, most of the
14 testing -- Mr. Preston just mentioned that in Seattle, the
15 antenna was external, and we believe a lot of testing in
16 Tampa, the antenna was external. So you really have to tie
17 yield to the antenna. And again, I would suggest we need to
18 think about what kind of phones people are going to buy and
19 how those antennas are going to work in there when we talk
20 about yield.
21 MR. BELL: I need to respond to that, because
22 that's directed at SnapTrack and Motorola. Is this on?
23 Hello?
24 First, let me say that my colleague from
25 TruePosition widely quoted this paper from Motorola that is

1 now over a year old. There have been filings made that
2 correct that, and I would direct the attention of the FCC to
3 those filings.
4 Let me see if I can clarify this picture about
5 sensitivity and antennas. It is certainly true that
6 sensitivity is everything relative to GPS, because that's
7 really what drives the ability to let GPS work in indoor
8 settings and in urban canyons that it originally was not
9 designed for. That's really why we've gone to the
10 SnapTrack, was to apply high sensitivity techniques.
11 Thanks to some really good inventions by Dr.
12 Croster and a lot of hard work, we've been able to achieve
13 already a 20 db -- that's 20 db, not two db, but a 20 db
14 improvement in sensitivity over conventional GPS. Now,
15 clearly, you have to give some of that up for antenna
16 performance and other factors associated with integrating
17 this technology in the handsets.
18 The error budget, or the budget we set to give
19 that up was three db when we originally laid out the
20 technology. Now, currently, that's running about six db.
21 It varies with the different small antennas and it's been
22 coming down from where we started with, which was maybe
23 eight or nine db. But we are still working toward, with
24 handset manufacturers and antenna manufacturers, improving
25 the performance so we can reach this three db budget.

1 Now, in addition, we are continuing our work on
2 higher sensitivity and we've already laid out a program to
3 give us six or seven db more and I think several of the
4 other speakers have talked about GPS is really advancing
5 what you see now. It's not the ultimate in performance.
6 So we're working from both ends to deal with some
7 reduction in performance of antennas in enhanced
8 integration. We're working it from both sides, both
9 improving our sensitivity and getting the antenna
10 performance tuned up as much as it possibly can be.
11 MR. HATFIELD: Can we come back over here? You've
12 been very patient.
13 MR. CHADNEY: Yes, Tony Chadney from AirTouch
14 Communications and I have three questions relating to
15 accuracy and the conditions under which they were taken.
16 The first one I'll start off with is related to
17 this business of the type of environment in which the tests
18 are made. And from what I'm hearing here, there are issues
19 of whether this will perform well in a rural environment or,
20 if it does well in the rural environment, is it going to
21 perform in an urban environment well, and vice versa?
22 And the CDG recognize this, starting about a year
23 ago, and formed a test group to location forum and part of
24 that location forum was a test group. This test group was
25 to lay out conditions under which measurements should be