Mobile videotelephony

Test of 3G telephones
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Test of 3G telephones

Andreas Richter
Foreword
The launch of the first 3G telephones a few years ago involved a revolution for many deaf sign language users. Users that had previously had to use SMS were now able to make video calls using mobile telephones. Mobile video calls have not had the same impact for hard of hearing and late-deafened people who have Swedish as a first language. Some conceivable reasons for this are that these people can cope with mobile voice calls to a larger extent and that the quality of video calls is too low.

The Swedish Handicap Institute, the National Post and Telecom Agency (PTS) and the Swedish Consumer Agency (KOV) have tested how well video calls using modern 3G telephones function for deaf, hard of hearing and deafblind people. The results of these tests are published in this report, comprising both measurements of telephone performance for video calls and an examination of particular functions. Several of the parameters that were tested are crucial for the opportunity of deaf people to use telephones. Others are crucial for whether hard of hearing, late-deafened or deafblind persons can use these telephones. The tests show that there are significant differences in performance and function between the different 3G telephones.

This report may hopefully provide a rough indication of the developments required to improve mobile videotelephony and help those consumers who intend to buy a 3G telephone.

Stockholm, February 2007
The Swedish Handicap Institute
Ulrika Brändström
Head of Testing Unit
Background and aim

The possibility of using sign language in video calls using 3G telephony affords deaf people a completely new opportunity for mobile communication. Previously, deaf people had to use SMS, a form of communication that is both time-consuming and unreliable. When the mobile telephone operator 3 started to sell 3G telephones, many deaf people took out subscriptions for 3G telephony.

The Swedish National Association of the Deaf (SDR) had already raised the issue of conducting quality tests with the National Post and Telecom Agency in 2005, in respect of 3G telephones orientated towards the needs of deaf users.¹ The Swedish National Association of the Deaf also contacted the Swedish Handicap Institute to enquire about carrying out tests. This resulted in collaboration between the Swedish Handicap Institute, the National Post and Telecom Agency and the Swedish Consumer Agency to discuss the possibilities of conducting comparative tests of 3G telephones.

Trials were commenced quite soon afterwards with interpretation via 3G by the Communications Service for Videotelephony. This trial was given the name 'The Pocket Interpreter', which is a play on the possibility of getting the assistance of an interpreter at any time or place. Since 1 September 2006, the interpretation of 3G calls forms part of the assignment of the Communications Service for Videotelephony. This service is run by Interpretation Centre within Örebro County Council (the Örebro County Council Interpreter Centre), but other interpreter centres are used as sub-contractors. There are two types of interpretation of 3G calls: first the relay of telephone calls between two people who are located in different places, second distance interpretation between two persons who are located at the same place. For distance interpretation, the 3G telephone is used both to sign and speak into.

Comments were made on the quality of the video calls using 3G telephones in the course of the pocket interpreter trial period. The Örebro Interpretation Centre predicted that the quality of the calls would entail a trying working situation for the interpreters. It subsequently transpired that the interpreters were able to work under the conditions that prevailed, but that they considered 3G interpretation to be significantly more demanding than the interpretation of calls from stationary videos. The calls that are communicated from 3G telephone are nor-

mally shorter than calls from stationary videophones, but the service is perceived to be important owing to mobility.\textsuperscript{2}

At the same time as 3G telephony has brought a new opportunity for deaf people to communicate at a distance, there are limitations to the technology and the desire to pursue further developments. The differences between ‘live’ sign language and sign language in video calls are, among other things, that the users must adapt the language to a small area, the signing space,\textsuperscript{3} and the frame rate frequency of the telephone. The limited signing space means that that the size of the signs must be confined, while other factors require sentences to be shortened and signs to be made in an abundantly clear way and at a reduced speed.\textsuperscript{4}

The aim of this project is to conduct a trial and provide a simple overview of the opportunities afforded by modern 3G telephones. This overview may be of benefit through, among other things,

- providing deaf people with guidance when choosing a telephone,
- providing manufacturers of 3G telephones with an indication of how well their products are adapted for deaf people and to some extent for hard of hearing and deafblind people,
- highlighting the parameters that are important for sign language communication using 3G telephones.

Examples of important issues that should be answered are:
- What frame rate frequency do the telephones have?
- Are there any telephones that are designed for the target group of deaf people?
- Are modern 3G telephones better for deaf people than the earlier 3G telephones?

Letters were sent to all of the major operators and manufacturers in order to establish a dialogue regarding the tests. Those contacted were Tele2 Sverige AB, TeliaSonera Sverige AB, 3 (Hi3G Access AB), Telenor Sverige AB, Sony Ericsson Mobile Communications AB, Nokia Mobile Phones, Samsung Electronics Nordic AB, Motorola AB, LG Electronics Nordic AB and Siemens AB. Unfortunately, we did not receive responses from any of the businesses written to.


\textsuperscript{3} The area where signing can take place at a certain distance from the camera.

\textsuperscript{4} Björk, Jenny (2006). Jag ser inte vad du säger – En studie av dövas subjektiva upplevelse av kvaliteten på kommunikation via 3G-telefoner [I can't see what you are saying: A study of the subjective experience of deaf people of the quality of communication via 3G telephones].
During the course of the project, meetings have been held on a regular basis with a reference group comprising representatives from the National Post and Telecom Agency, the Swedish Handicap Institute, the Swedish Consumer Agency, the Örebro Interpretation Centre, and the user organisations, the Swedish National Association of the Deaf (SDR), the Association of Late-Deafened in Sweden (VIS), the Association of the Swedish Deafblind (FSDB) and the Swedish Association of Hard of Hearing People (HRF).

Test parameters

In consultation with the reference group, a number of parameters were selected that are of importance to people who are hard of hearing, deaf or deafblind. Most of the parameters included in the test are contained in the recommendation issued by the standardisation body, ITU (International Telecommunications Union). This recommendation specifies, for instance, the tolerances that are acceptable for audio and video synchronisation and the frame rate frequency required for video communication. The user organisations have also presented their own proposals for test parameters.

The reference group considered that testing the following parameters would be of greatest interest:

- **Picture quality/resolution**
  Picture quality/resolution is important for distinguishing details during the call.

- **Audio and video synchronisation**
  If audio and video are to be sent from a telephone simultaneously, the time difference between the audio and video must not be greater than 0.1 seconds in the telephone where the audio/video is heard/seen. This requirement applies to ensure that lip-reading is possible during the call.

- **Audio and video delay**
  The audio or video delay should be less than 0.4 seconds to avoid the conversing parties 'speaking over each other'. If the delay exceeds 0.8 seconds, it is difficult to implement a call at all.

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6 Ibid.
7 Ibid.
• **Frame rate frequency**
The ITU's recommendation states that a frame rate frequency exceeding 20 pictures per second is required for unimpeded sign language. According to the specifications found on the website of mobile telephone operator 3®, those 3G telephones that specify the frame rate frequency, can cope with 10 or 15 pictures per second.

• **Battery capacity (maximum time for video calls)**
Manufacturers do not always specify the length of the telephone's call period in respect of video calls. A measurement should be conducted to compare the battery capacity of the telephones.

• **Camera angle**
The angle of the camera used for video calls with sign language, i.e. the camera that enables a person to be filmed at the same time as looking at the screen. A wide camera angle is important when a person needs to sign in video call environments where it is not possible to position the telephone at a distance, for example on a bus. If the camera angle is narrow, it may also be important that the picture of the conversing party on the screen is wide, as the user may be compelled to sign further away from the telephone. It is extremely unusual for the camera angle to be specified in the product information provided by the manufacturers or operators.

• **Possibility of signing with two hands**
In order to be able to sign with two hands, it is crucial, among other things, that the camera can be placed on a table or the like without any major problems. With clamshell (flip) mobile phones where the camera is located inside the cover, it is easy to direct the camera in the direction of where the person is signing.

• **Possibility of connecting to a Braille display**
Some deafblind people need a mobile telephone with Braille display or speech synthesis. At the present time, software exists for the Symbian 60 and Windows Mobile operating systems, but sometimes this software must be modified to function with newer telephones.

• **Screen illumination and contrast**
It should be possible to adjust the illumination and contrast of the screen, among other things, in order to be able to see the screen in sunny outdoor conditions.

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* Jämför alla mobiler [Compare all of 3’s mobiles]. 3 [www].
• **Size of the screen**
  It is important to have a sufficiently large screen primarily because although the person making the call will need to sit at some distance from the telephone (so that their head and hands can be seen) they will still need to be able to see who they are calling on the screen.

• **Possibility of connecting to neckloop/audio equipment**
  People who are hard of hearing can use a 'neckloop' or an 'ear loop' that are plugged into the telephone's headset. Some people can be aided by tactile support combined with lip-reading. In that case, sound is linked to a special assistive device via an audio cable.

Furthermore, tests were conducted on the basis of the following issues:

• **Interoperability: Is it possible make telephone calls between different telephones?**
  For hearing people, it goes without saying that it is possible to ring each other up using different mobile telephones. Information from the Örebro County Council Interpreter Centre suggests that different 3G telephones use different video coding algorithms, which may mean that two telephones do not function (i.e. are incompatible) with each other.

• **Can telephones make calls to and be called up from the Communications Service for Videotelephony?**
  The technical preconditions to call the Communications Service for Videotelephony should be provided even if a deaf person never calls the service.

• **Possibility of cutting out the GSM network**
  The GSM network causes interference to electronic equipment; for example, hearing aids. As mobile telephones are of course used close to the hearing aid, the GSM network often causes interference. This interference can vary partly depending on the model of the mobile telephone and partly on the model of the hearing aid.

The 3G network does not use the same radio signals as the GSM network and there is a significantly lower risk of it interfering with hearing aids. However, when 3G telephones are delivered from the shop, they are set to be used for both the GSM and 3G networks. It is possible to set some telephones so that the GSM network is not used, which removes the risk of interference.

One disadvantage of cutting out the GSM network is that reception is worse.
Telephones tested

Selection of test telephones

In order to restrict the scope of the test to a level that made it feasible to implement within a short time, a selection was made of 3G telephones in the Swedish market. It was important that the tests were conducted over a short time period so that the telephones tested would still be available in the market when the results were published. The intention was to test the telephones of all manufacturers represented in the Swedish market that were offering telephones in a mid-price range. It was decided to select telephones at a price level between SEK 3 000 and 4 000, provided that this was the cash price without any locking to a specific operator. When selecting telephones, a minor deviation was made from these guidelines, among other things because some suppliers did not offer telephones in the right price bracket and because telephones that were new to the market were given priority over older models. Two telephones of each model were acquired:

Telephones included in the test were:

- Sony Ericsson Z610i
- Samsung SGH-Z150
- BenQ-Siemens EF81
- Nokia N73
- LG U890
- NEC e616v (reference telephone)

The manufacturer Motorola also has a 3G telephone in the Swedish market. However, Motorola exchanged the model in the market (RAZR V3x) with a new variant (MOTORAZR V3xx) during the test period, which meant that none of these telephones could be ordered prior to the tests. It was not considered relevant to test a model that was not available in the market.

Reference telephone

A decision was made to also test the telephone that many deaf people use, or have used, and whose quality is known to many. This telephone, referred to by some as the 'deaf telephone', was manufactured by NEC and has the model name e616v. NEC is no longer represented in the Swedish mobile telephone market. It was decided to use a reference telephone with which most deaf people are familiar so that many of the deaf people who learned of our test results would be able to relate these results to their own experience of the NEC telephone. Some
reasons for the NEC telephone being favoured by a large group of deaf people is that it has quite a rapid frame rate frequency, a large picture and a wide camera angle.

**Test methods**

Most parameters are self-explanatory and do not need any further explanation. A description is provided below of the test methods for the other tests. These tests were carried out at the Swedish Consumer Agency's premises at Rosenlundsgatan in central Stockholm. These premises have good general illumination and also provided strong spot lighting of the objects filmed during the video calls. The tests were conducted near a bay with windows with good 3G network coverage.

**Frame rate frequency**

In these tests, frame rate frequency has been calculated as the average number of pictures per second that can be registered during ten randomly selected seconds. When making the measurements, a row of light-emitting diodes (LEDs) was used, comprising eight LEDs in a row on a circuit board. The LEDs blink in turn one after the other and the rate of blinks can be regulated using a knob. During the tests, the row of LEDs has been set against a white background with strong spot lighting, as the frame rate frequency decreases under impaired lighting conditions.

The test was conducted by making video calls between telephones of the same brand and model. The 'transmitting' telephone films the row of LEDs and the 'receiving' telephone's screen is filmed using a video camera. By allowing the row of LEDs to blink at a particular frequency, 15 or 10 Hz, and observing how many of these blinks can be discerned by the receiving telephone, it is possible to compute the telephone's true frame rate frequency. The actual frame rate frequency can show that pictures 'disappear' when they are sent between two telephones. The transmitting telephone can film extremely well at, for instance, 15 pictures per second, but the actual frame rate frequency is determined by how many of these pictures are shown in the receiving telephone. This measurement means that the telephone and network are tested at the same time. The telephone models were tested in the different operators' networks so that it was possible to determine whether any of the deviations were attributable to the operators.

Occasionally, it appears on the receiving telephone as though several diodes have lit up at the same time even if in fact only one diode lights up at once in the row of LEDs. It can be assumed that this is due to the following factors:

- That the transmitting telephone's camera has a long shutter speed resulting in each frame filming several blinking diodes.
• That the camera phase and LED phase of the transmitting telephone are different even if the frame rate frequency is the same as the diodes' rotation frequency.

• That the part of the picture that shows an illuminated diode cannot be updated when the diode is turned off. This probably results from the transmitting telephone not giving priority to transmitting updates.

If two LEDs are visible at the same time in the receiving telephone, then two situations may arise:

1. In the video it appears that the LEDs light up simultaneously and turn off simultaneously. This suggests that the transmitting telephone's camera has a long shutter speed and so films the two diodes lighting up in one and the same picture. Thus, in that case, the fact that the two LEDs can be viewed in the receiving telephone does not mean that two pictures were sent.

2. In the video, it appears that one of these LEDs lights up prior to the other or that it turns off while the other LED is still alight. This suggests that the telephone's camera and the LEDs have different phases.

To minimise the effect of long shutter speeds when making these measurements, the video recording has been read picture by picture and the number of changes in the receiving telephone's screen have been counted over a number of seconds. The average number of changes per second is calculated and represents the frame rate frequency.

The measurements have been made without any moving details except the LEDs filmed by the transmitting camera. This might represent a weakness in the test structure as these conditions do not resemble the preconditions applicable for video calls using sign language. When the LEDs are filmed, the changes from picture to picture may be assumed to be less than when filming sign language and there is less load on the camera's codec\(^9\). This, in its turn, should mean that the frame rate frequency measured with the aid of the LEDs is greater than or as high as when ordinary video calls with sign language are used. One advantage of this method in relation to tests using sign language is that it is simple to set up and thereby simple to replicate. The measurements that can be discerned may be higher than during ordinary use, but provide an impression of the capacity of the telephones.

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\(^9\) A codec is a component that 'packages' and 'depackages' (i.e., encodes and decodes) sound or video for transmission in the data network/wireless network.
Delay

Delay has been measured by observing the time it takes for video or audio that is registered in the transmitting telephone to be shown or heard in the receiving telephone during a video call. Under the ITU recommendation, the delay must be 0.8 seconds for the quality of the call to be acceptable and under 0.4 seconds for the quality to be good.

- **Video delay:**
  The camera of one of the telephones was directed at the row of LEDs, which blinked at a frequency of 10 Hz. Both the row of LEDs and the screen of the 'receiving' telephone were filmed using a video camera. In order to obtain a reference point in time, half of the area shown in the transmitting telephone's camera was covered by a white paper sheet. When the paper sheet was suddenly removed, this provided a precise time reference point. The time it takes for the event to be reflected in the receiving telephone's screen has been registered. An average value of the length of delay can be calculated by then registering how long it takes for a particular LED that has already lit up to light up in the receiving telephone's camera.

- **Audio delay:**
  Audio delay can be estimated by tapping on one telephone and listening for how long it takes before the tapping is heard on the other telephone. A precise rate is established by then tapping in pace with the time it takes for the sound to transfer. The frequency of the sound and thereby the delay time is worked out by calculating the number of beats per minute using the calculation: \( T = \frac{60}{\text{number of beats per minute}} \). In this case, the test has been conducted using manual tapping, but could just as well have been conducted using a metronome.

Synchronisation

Synchronisation is calculated on the basis of the difference between the audio and video delay. It is thus not measured directly, but has been derived from other measurements.

Signing space (camera angle)

The signing space is measured by placing the telephone 80 cm from a ruler. The telephone's camera is then directed so that the direction of the depth is at a right angle to the ruler. The distance between the boundaries of where the camera can film are measured on the ruler. Two measurements are made: horizontally and vertically. The camera angle can be calculated on the basis of the values measured, but here it is the area that is presented (the signing space) as this is easier to visualise than camera angles.
Figure 1. Sketch of signing space

The rectangle constitutes the signing space

3G telephone

Possibility of connecting a neckloop

Neckloops for mobile telephone can be bought from supplies of assistive devices for the hard of hearing. These neckloops have a standard jack (2.5mm tele) and normally need an adapter linked between the telephone's jack for the headset and the neckloop. This results from mobile telephones having their own standards for the design of headset jacks. Furthermore, the manufacturers usually change the design of the jacks at regular intervals. This means that the manufacturers of neckloops have problems in supplying and testing functionality in relation to different telephones. Adapters for Nokia and Sony Ericsson phones are the easiest to get hold of in Sweden.

The simplest and probably best alternative for consumers is the possibility of buying a neckloop as an original accessory. This means that the neckloop is branded with the telephone manufacturer's name, that it can be used without an adapter, and that the manufacturer guarantees good functionality with the telephone in question.

Resolution

No functioning method for the measurement of resolution has been found during the course of the work and it has therefore not been possible to conduct a measurement of the resolution.

When checking the specification on 3's website, it can be concluded that the resolution for video calls is normally QCIF, 176 x 144 pixels.
None of the specifications that occur on the website specify any resolution other than QCIF.\textsuperscript{10}

**Screen brightness and contrast**

It was checked whether it was possible to set the brightness or contrast on the screens of the mobile telephones tested. The intensity of the brightness or contrast on the screen has not been measured. It may be very important for a screen to be bright if the telephone is being used in sunny conditions outdoors. The possibility of reducing the screen’s brightness may save the battery.

**Call period**

Call periods have been measured by connecting a video call between a fully charged telephone and a telephone that is being continuously charged. Both telephones were filming the row of LEDs. When the battery in the uncharged telephone ran out, the telephone switched off, and the call period was then read from the other telephone.

**Result**

The results of the tests conducted are presented in Table 1 on the next page. The recommendations made by ITU are, when applicable, shown in the column to the far right.

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\textsuperscript{10} {Jämför alla mobiler [Compare all of 3's mobiles]. 3 [www].}
Table 1. Results of the tests conducted

<table>
<thead>
<tr>
<th>Telephone</th>
<th>Sony Ericsson</th>
<th>Nokia</th>
<th>BenQ-Siemens (BS)</th>
<th>LG</th>
<th>Samsung</th>
<th>NEC (reference)</th>
<th>ITU recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synchronisation (s)</td>
<td>0.13</td>
<td>0.25</td>
<td>0.53</td>
<td>0.09</td>
<td>0.01</td>
<td>0.3</td>
<td>&lt; 0.1</td>
</tr>
<tr>
<td>Delay, video/Video delay (s)</td>
<td>0.35</td>
<td>0.68</td>
<td>0.54</td>
<td>0.65</td>
<td>0.6</td>
<td>0.7</td>
<td>&lt; 0.8 is OK, &lt; 0.4 is good</td>
</tr>
<tr>
<td>Delay, audio/Audio delay (s)</td>
<td>0.48</td>
<td>0.43</td>
<td>1.07</td>
<td>0.73</td>
<td>0.6</td>
<td>0.5</td>
<td>&lt; 0.8 is OK, &lt; 0.4 is good</td>
</tr>
<tr>
<td>Frame rate frequency (Hz)</td>
<td>14</td>
<td>6.7</td>
<td>13.5</td>
<td>7.6</td>
<td>6</td>
<td>12</td>
<td>&gt;20 is good, &gt;12 can be used with difficulty &lt;8 is unusable</td>
</tr>
<tr>
<td>Own picture, size (width x height in mm)</td>
<td>10 x 9</td>
<td>10 x 8</td>
<td>13 x 10</td>
<td>8 x 8 – 13 x 13</td>
<td>10 x 8</td>
<td>12 x 10</td>
<td>–</td>
</tr>
<tr>
<td>Other party’s picture, size (w x h in mm)</td>
<td>28 x 22</td>
<td>36 x 30</td>
<td>25 x 21</td>
<td>35 x 28</td>
<td>30 x 25</td>
<td>33 x 27</td>
<td>–</td>
</tr>
<tr>
<td>Signing space at a distance of 80cm – camera angle (w x h in cm)</td>
<td>70 x 58</td>
<td>70 x 57</td>
<td>45 x 37</td>
<td>70 x 57</td>
<td>64 x 52</td>
<td>85 x 68</td>
<td>–</td>
</tr>
<tr>
<td>Call period (min)</td>
<td>130</td>
<td>164</td>
<td>92</td>
<td>195</td>
<td>128</td>
<td>No test owing to old battery. According to 3, the time is 131 min.</td>
<td></td>
</tr>
<tr>
<td>Possibility of setting screen illumination</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>Possibility of disconnecting from the GSM network</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>–</td>
</tr>
</tbody>
</table>


### Telephone Specifications

<table>
<thead>
<tr>
<th>Telephone</th>
<th>Sony Ericsson</th>
<th>Nokia</th>
<th>BenQ-Siemens (BS)</th>
<th>LG</th>
<th>Samsung</th>
<th>NEC (reference)</th>
<th>ITU recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neckloop is an original accessory</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>2.5 mm jack</td>
<td>–</td>
</tr>
<tr>
<td>Functions with Braille display</td>
<td>No</td>
<td>No. Though with speech synthesis</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>–</td>
</tr>
<tr>
<td>Interoperability with the other telephones tested?</td>
<td>Yes</td>
<td>Yes</td>
<td>Not with NEC</td>
<td>Yes</td>
<td>Not with NEC</td>
<td>Not with NEC or BS</td>
<td>–</td>
</tr>
<tr>
<td>It is possible to call the Communications Service for Videotelephony</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>Clamshell</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>The location of the camera</td>
<td>In the cover, above the screen</td>
<td>Above the screen</td>
<td>In the hinge</td>
<td>In the hinge</td>
<td>Above the screen</td>
<td>In the cover, above the screen</td>
<td>–</td>
</tr>
</tbody>
</table>

### Other results

No difference in performance can be observed for measurements made in the different operators' networks.

### Other factors

Besides the parameters included in the tests, the following can be said about the telephones tested:

- Nokia's telephone's camera has a colour scheme that has a red tone. This means that someone who calls a Nokia phone appears as warm or suntanned. This applied to both of the telephones tested.

- BenQ-Siemens EF81 tends to 'lock up' when the telephone is restarted. It appears to start, but after a moment turns itself off again.

Video calls between the different telephones have been documented with short commentaries on how the picture is perceived.

- **Sony Ericsson**: Good frame rate, but the camera in the telephone appears to adjust poorly to the surrounding light conditions. Rather blurred picture.
• **Nokia**: Red toned picture from Nokia. The picture appears to 'lock up' regularly; it gives a jerky impression.

• **BenQ-Siemens**: Grainy picture.

• **LG**: The picture from LG has fine details and colours, but it easily becomes jerky.

• **Samsung**: Low frame rate frequency, jerky picture when moving.

**Discussion and conclusions**

The NEC e616v reference telephone distinguished itself in the test primarily because it has a wide camera angle and a large picture. It is also flip-up with the camera fitted in the cover, which may very possibly be one of the most important parameters when a hard of hearing/deaf person chooses a telephone. Several of the new phones have narrower camera angles than the NEC telephone, but approximately the same camera angle in relation to each other, which may suggest that the manufacturers consider that these are the most appropriate measurements for video calls. The NEC telephone has properties that none of the newer telephones have; for example, a wider camera angle and a larger picture of the caller. Sony Ericsson and BenQ-Siemens are telephones with a higher frame rate frequency than the NEC telephone, but they are poorer as regards other parameters. One question that then arises is whether the higher frame rate frequency balances out the fact that the newer telephones are poorer in other respects.

Neither BenQ-Siemens's nor Samsung's telephone are capable of connecting calls to NEC's telephone. Regardless of whether NEC or the others comply with the standard, Samsung and BenQ-Siemens would be perceived as worse, as NEC is still present in the market and continues to be popular among deaf people. A deaf consumer is probably not inclined to buy a mobile telephone that cannot call an NEC telephone, which will almost certainly be used by several people in her or his circle of acquaintances.

Telephones from Sony Ericsson and NEC were the only ones in the test that had cameras located in the cover and which thereby are quite simple for users to position at a distance from themselves and align for video calls. This type of practical functionality may possibly outweigh purely performance-related functionality, such as frame rate frequency and video delay. One issue that the user organisations want an answer to is whether it is possible to sign with both hands; a parameter that is dependent on several factors. Among other things, it is important that the telephone is simple to position at a distance from the user on a table or the like, and also that the camera angle is sufficiently wide for hands and face to be seen. It is possible to see from the Table that Sony
Ericsson's and NEC's telephones are the ones that are most suitable for signing with two hands, as they are flip-up and have a camera in the lid, which means that the camera angle can be tilted vertically. As mentioned above, NEC is preferable to Sony Ericsson as it has a greater signing space and a larger picture of the conversing party.

With videotelephony, some of the telephones tested yielded good results for audio and video synchronisation. Videotelephony in the 3G network is seldom referred to as anything that hard of hearing people would benefit from, but if audio and video synchronisation is good, there are good preconditions for support through lip-reading. One question that would need to be answered, however, is whether the small screen and poor resolution is sufficient to provide good lip-reading support.

From the telephone manufacturers included in these tests, it appears that Nokia was the manufacturer that consciously developed solutions for people with a disability, as they have developed their own neckloop and, according to information received, have support for text telephony in the N73 model tested. On the other hand, this telephone does not perform well for video calls.

Sony Ericsson's telephone appears to be very suitable for video calls using sign language, as it has a high frame rate frequency and one of the largest video pictures among the telephones tested. These parameters do not necessarily indicate any conscious initiative on the part of Sony Ericsson towards accessibility for people with a disability as a good frame rate frequency also makes it easier for hearing people to make video calls.

These tests have been conducted on a selection of telephones that will probably no longer be available in the market within a year. The test shows that telephones differ in many respects. For many people, primarily deaf people, it would be easier if suppliers or operators had specifications with some or all of the parameters that have been tested here. It is important that these parameters reflect the telephones' performance under realistic conditions and not what the theoretical performance shall be.

In the current situation, we wish to urge those who intend to purchase a 3G telephone for making video calls in sign language to ask to be allowed to make test calls with the telephone. Test calls should be made both indoors and outdoors in daylight, as the frame rate frequency is significantly affected by light conditions. At present, this is the simplest way of finding out whether or not a telephone is usable.

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13 Hearing. Nokia Accessibility [www].
Further work

The results of the test show that 3G telephones differ significantly as regards performance for videotelephony. However, it is not possible to conclude that one particular telephone is better than the others. The guidelines for good sign language communication via video as stated by ITU are not satisfied by the telephones in this test. This is explained partly by the limitations of the data rate in the 3G network, which requires high compression of video communication. The fact is that videotelephony in mobile telephones needs to be further developed for sign language use of a fully satisfactory quality.

In order to make the choice of 3G telephones easier, manufacturers or operators ought to provide information about the telephones' performance. Some information may be straightforward, for example whether or not a neckloop is available as an original accessory. Other information, such as the frame rate frequency, ought to be based on measurements made on the 3G telephone. This report describes a method of measuring that is quite simple to replicate. However, this method may yield results that are better than those that the telephones are actually capable of achieving for video calls using sign language. Further development of a standard for the measurement of frame rate frequency for video calls is required.

The tests conducted in this project demonstrate the telephones' performance. The importance of this performance and the validity of this test need to be verified by people who have been deaf since infancy (sign language users) and people who are late-deafened, hard of hearing or deafblind testing the telephones and giving their opinions.

The Swedish Handicap Institute, the Swedish Consumer Agency and the National Post and Telecom Agency are deliberating on conducting user tests of 3G telephones in the spring of 2007. The user groups that may be included in the tests are people who are deaf, hard of hearing or deafblind.
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Internet


Taken from <http://www.itu.int/rec/T-REC-h> 2 January 2007.


The Swedish Handicap Institute (SHI) is a national resource centre on assistive technology and accessibility for persons with disabilities. SHI work for full participation and equality for persons with disabilities by ensuring access to high-quality assistive technology, an effective provision of assistive devices and an accessible environment.

The activities of the Swedish Handicap Institute cover:
• testing and procurement of assistive devices
• research and development
• analyses of needs, knowledge and method development
• training and capacity building
• international cooperation
• information

The Swedish Handicap Institute is run by the Ministry of Health and Social Affairs and the Swedish Association of Local Authorities and Regions (SALAR).