

Quality of Subsampled Video on Mobile Devices

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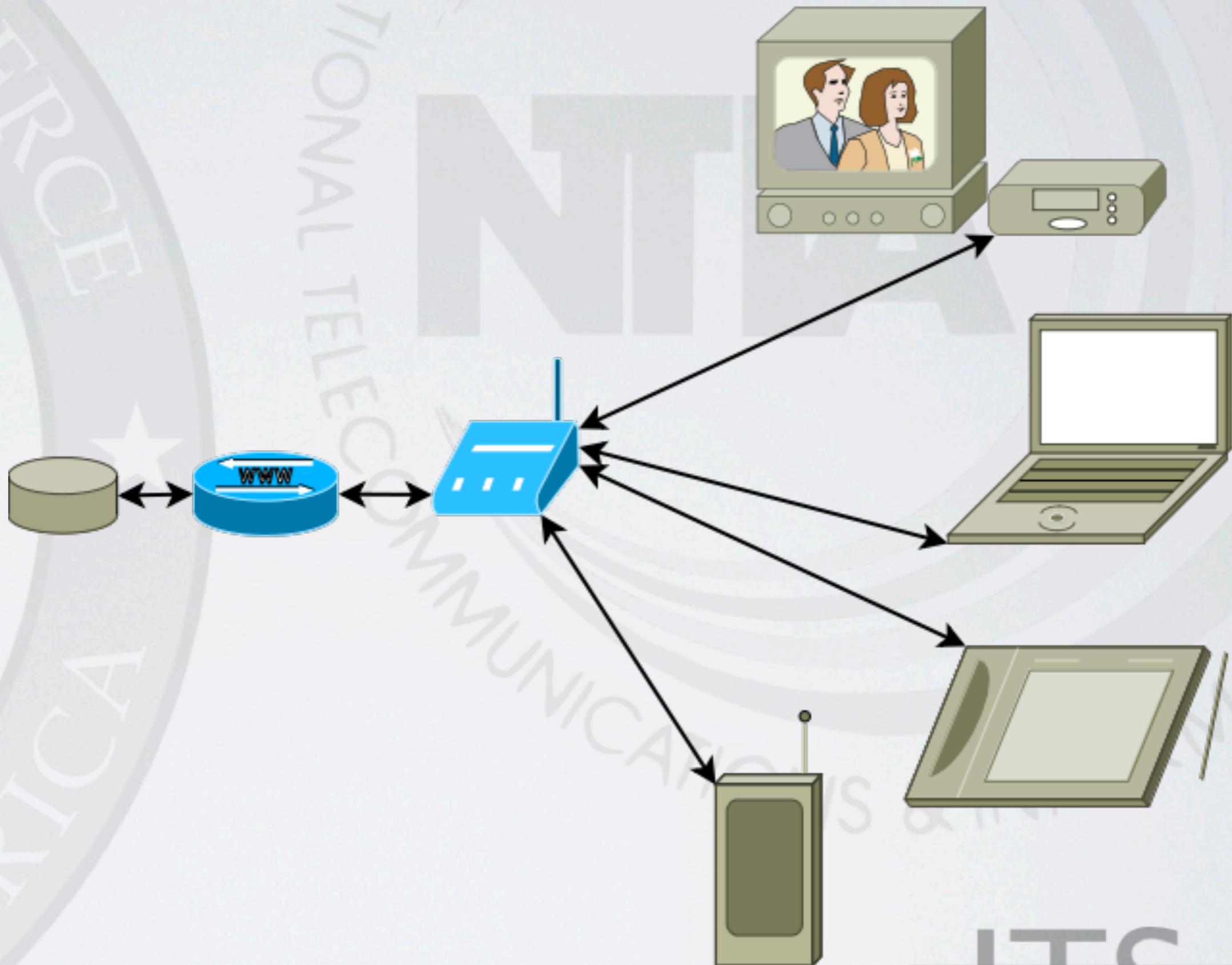
If a given video signal is delivered to a home and then modified to work on various mobile devices, how does that modification affect the quality of the video?

In this experiment we test the effects of subsampled video and experiment location on multimedia quality.

This is a first step in determining Quality of Experience on mobile devices. Once factors such as benefits derived from portability, usability, and mobile network performance are known, the combination of these factors can be used to predict Quality of Experience.



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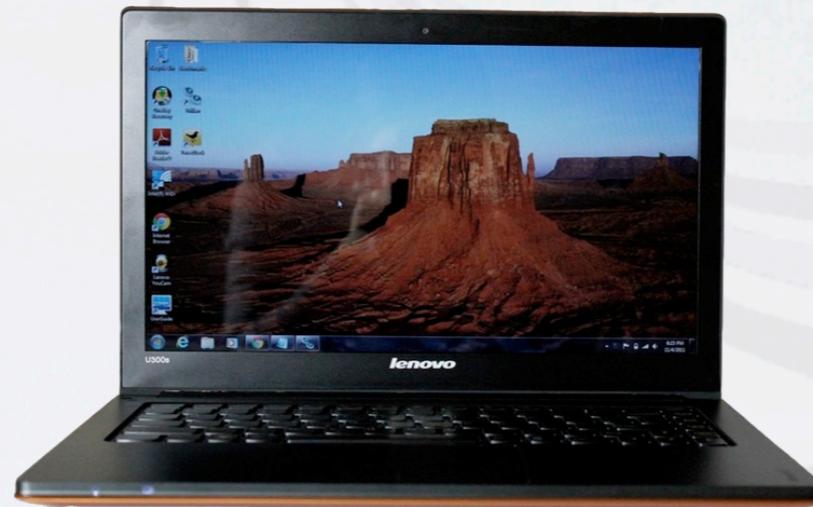


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Source HD Video

- 8 scenes
- 3 video impairments
- no audio impairments

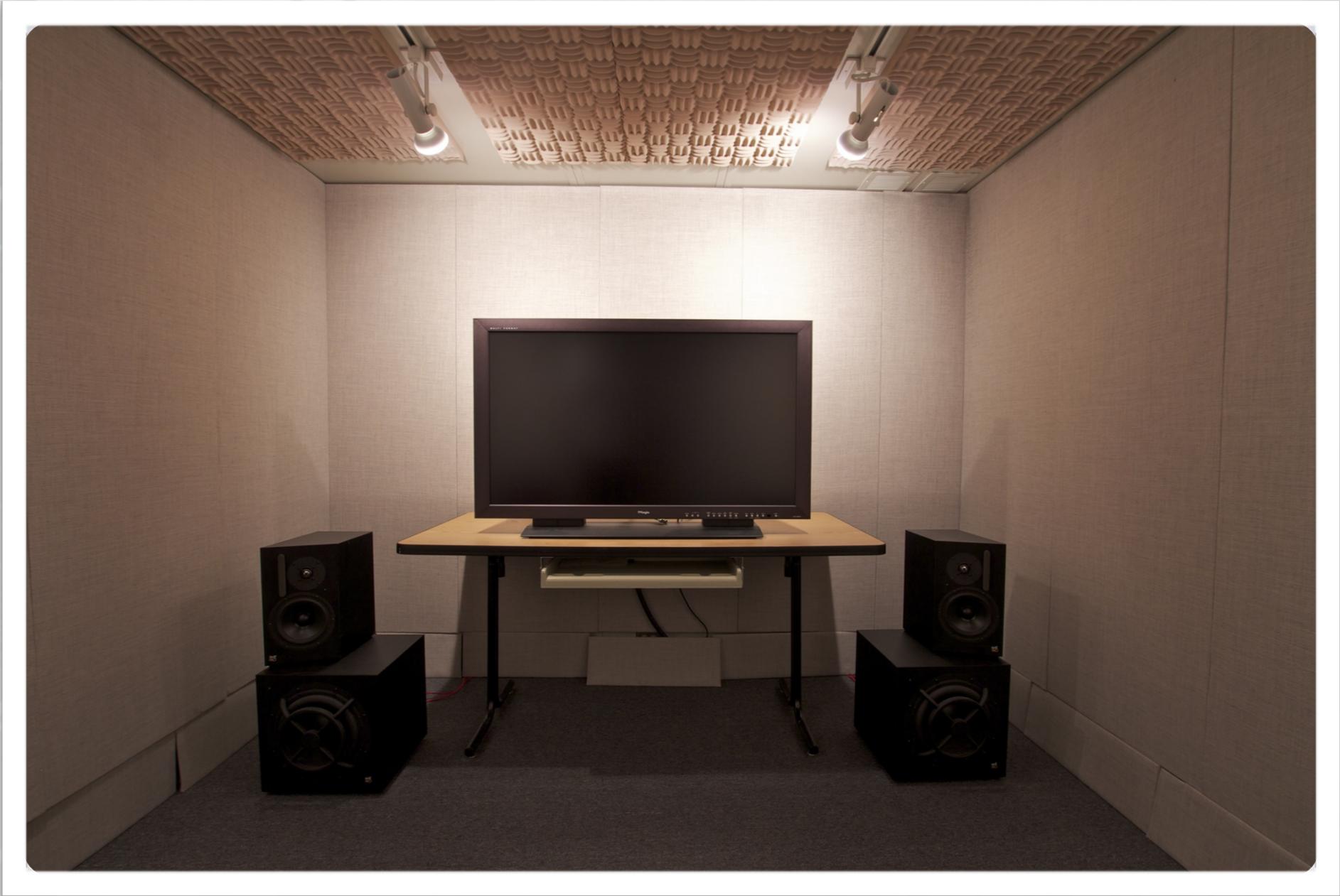
Handbrake
(x264)



HTML PostgreSQL



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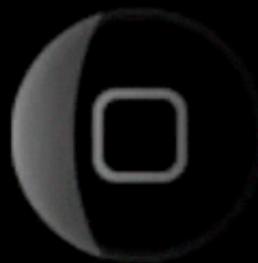
Procedure

1. We read instructions to the subjects
2. Subjects participated in practice sessions for each device
3. Half of the subjects began in the standards-based room, half in the simulated living room
4. Devices were tested in a random order
5. Subjects were allowed breaks
6. After all the tests were completed in one room, they were restarted in the other room

Carrier



11:12 AM



excellent

good

fair

poor

bad

Carrier

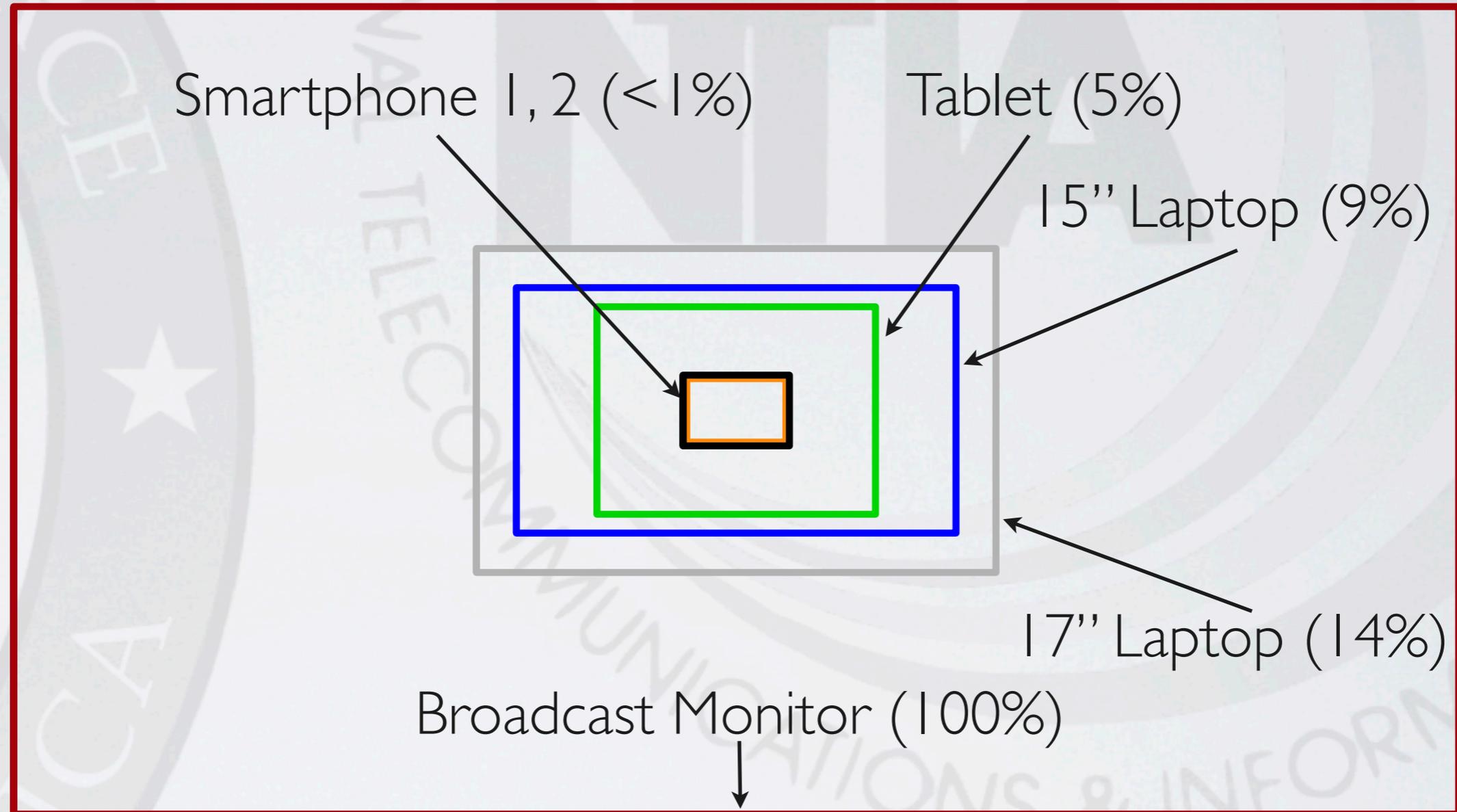
11:14 AM

100%

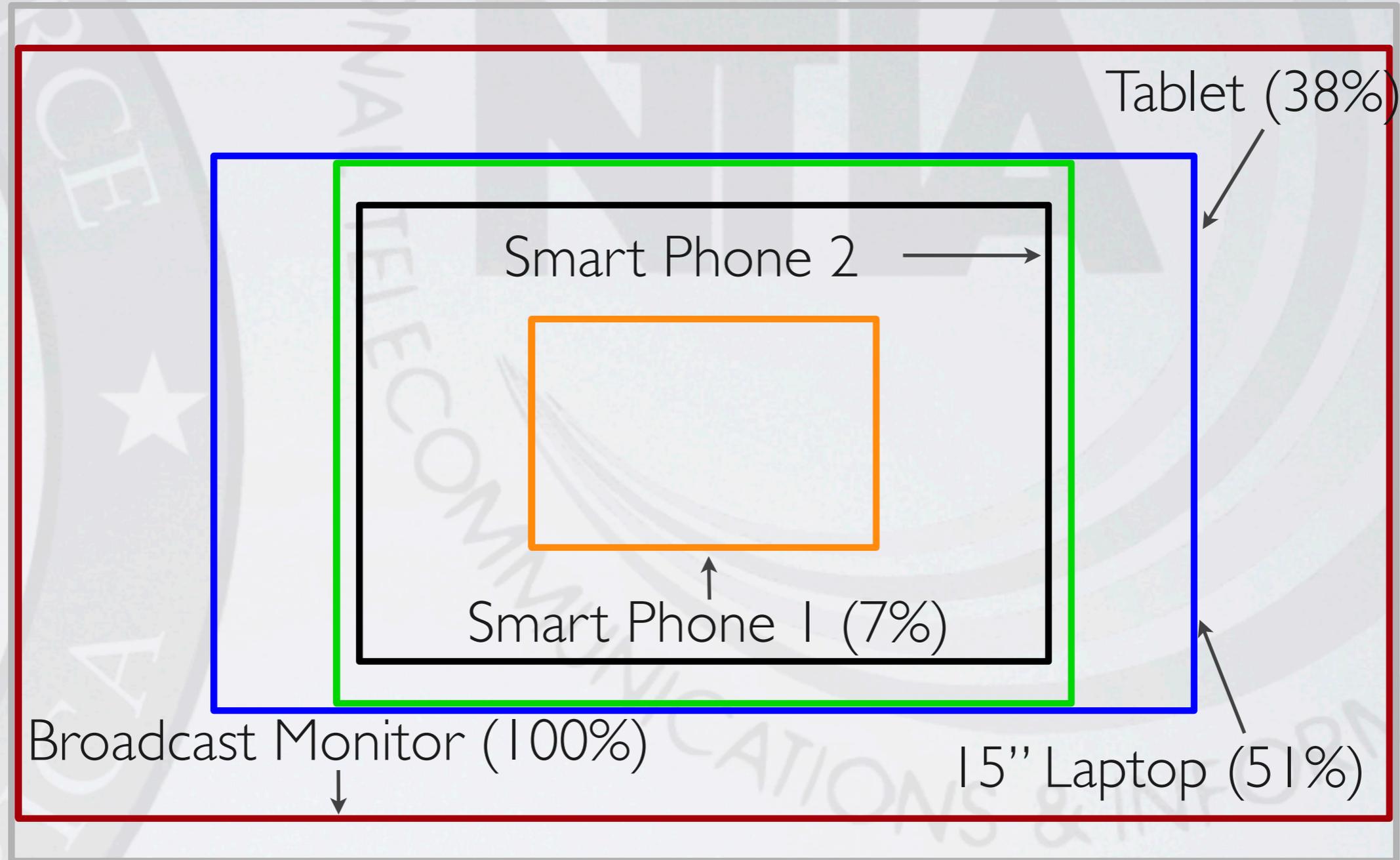


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Physical Dimension Comparison



Pixel Count Comparison



17" Laptop (111%)

Display Comparison

| | percentage physical size | percentage pixel count | display resolution | percent downsampled |
|-------------------|--------------------------|------------------------|--------------------|---------------------|
| Smart Phone 1 | 0.6% | 7.41% | 64 p/cm | 75% |
| Smart Phone 2 | 0.6% | 29.6% | 128 p/cm | 50% |
| Tablet | 4.95% | 37.9% | 52.2 p/cm | 46.7% |
| 15" Laptop | 9.24% | 50.6% | 44.1 p/cm | 28.9% |
| 17 Laptop | 14.42% | 111% | 52.5 p/cm | 0% |
| Broadcast Monitor | 100% | 100% | 18.9 p/cm | 0% |

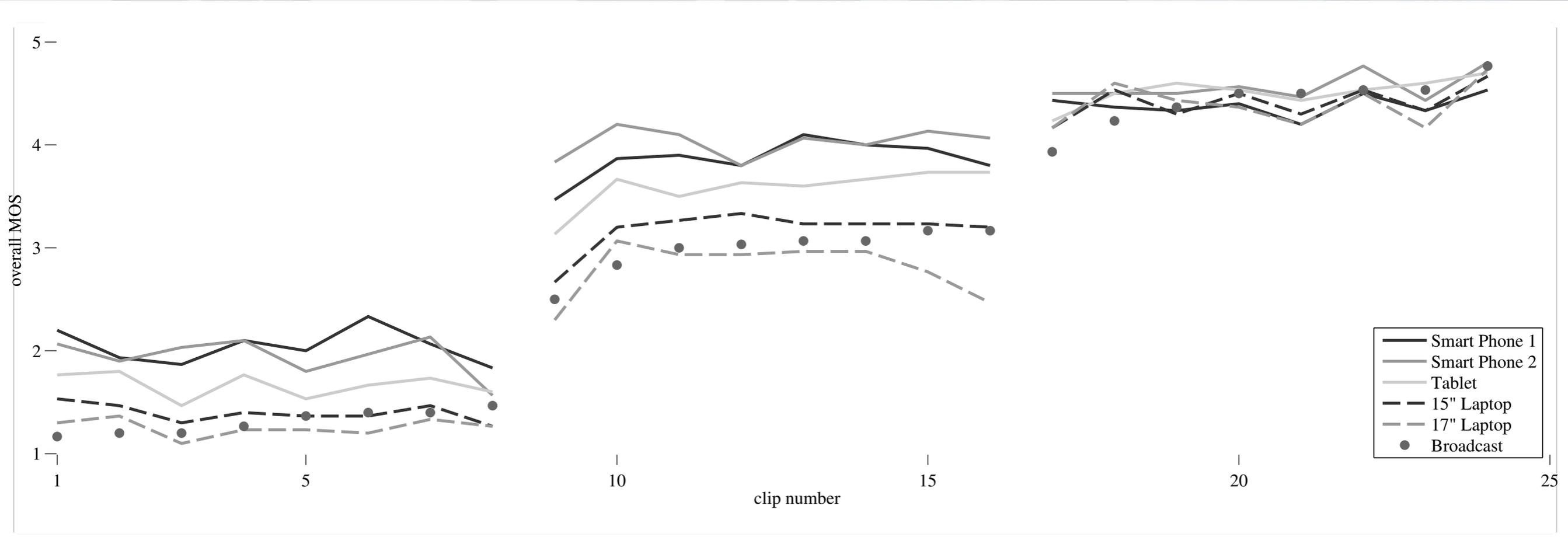


Smart Phone 1 (64 p/cm)

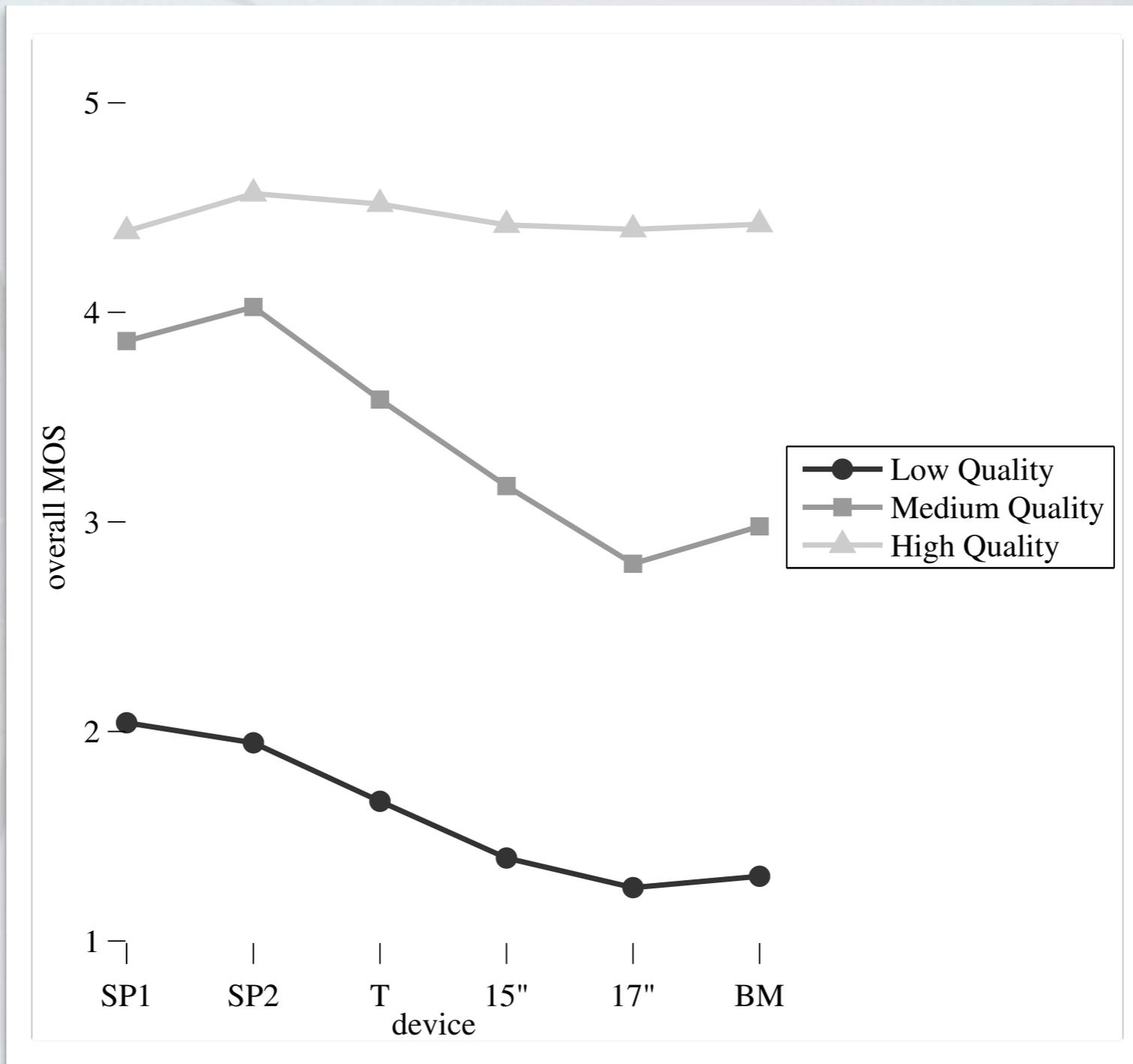


Smart Phone 2 (128 p/cm)

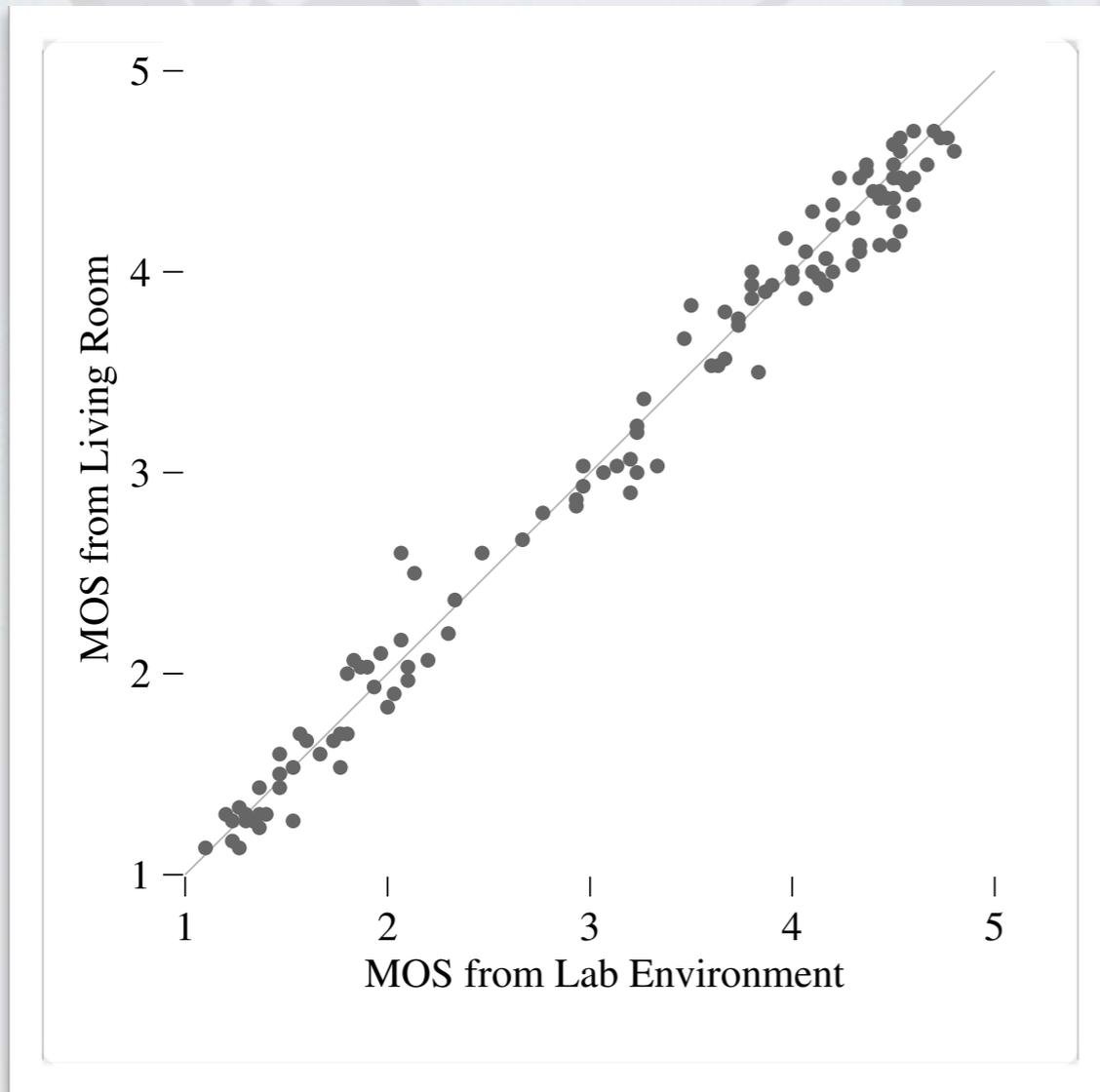
MOS per Clip by Device



MOS Averaged Over Clip by Device

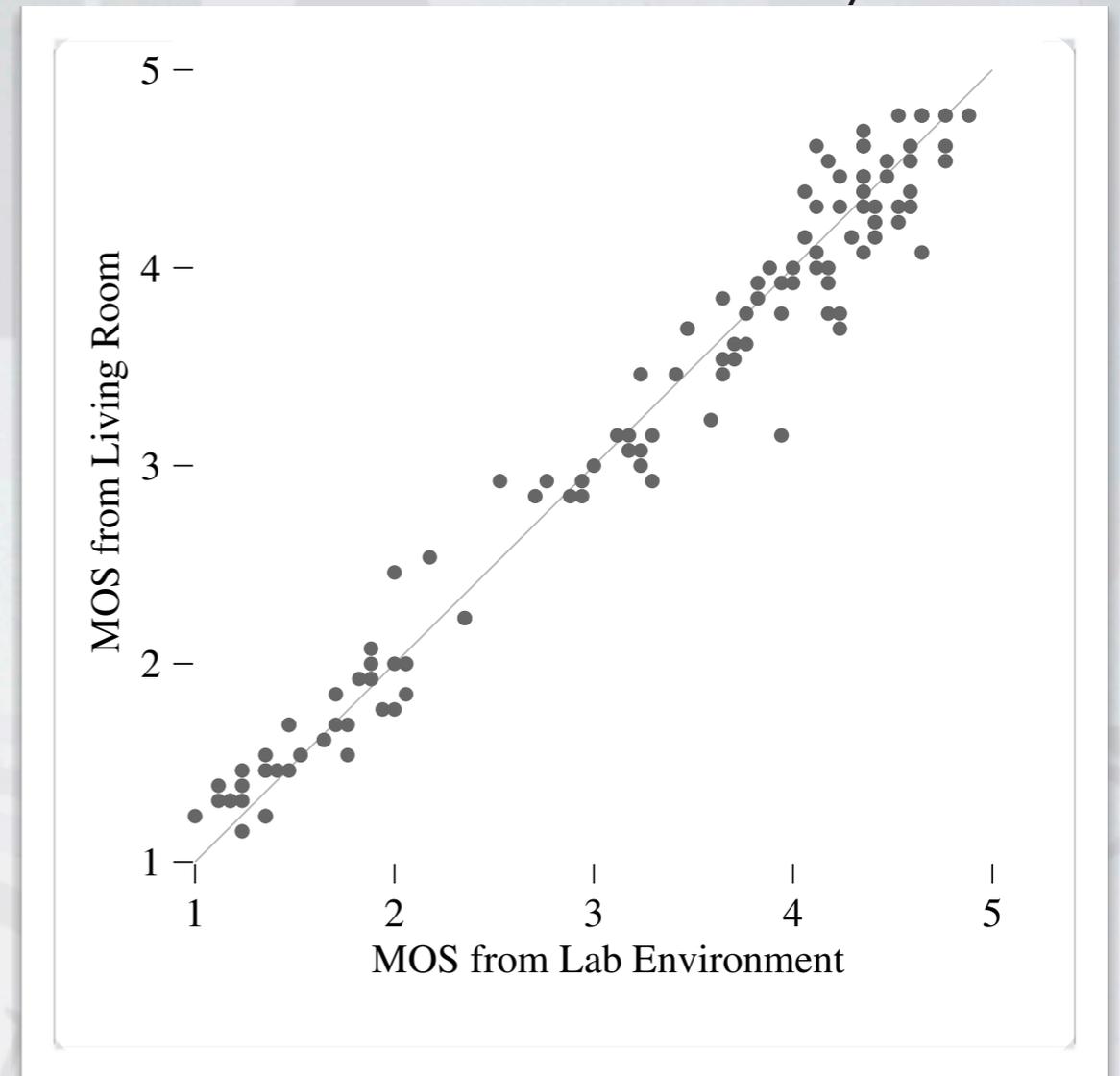


MOS per clip by environment



correlation: 0.992

MOS per clip by environment, first environment only



correlation: 0.985

Results

- Predictably, impairments were more visible on larger screens—they were reduced on smaller screens
- Correlation between environments is very high
- The test is repeatable: rooms that don't comply with standards give similar results
- For same-size devices, pixel densities tested didn't have a strong effect
- For this test, the resolution of small devices compared favorably with HDTV monitor

Conclusions

- This test was implemented using standardized tools and could be replicated or distributed very easily
- Results from non-standards-based environment compared favorably to results from standards-based test environment
- Multimedia quality of low-quality clips scores are higher on smaller monitors
- Test architecture allows for easy distribution and test location flexibility (redundant)



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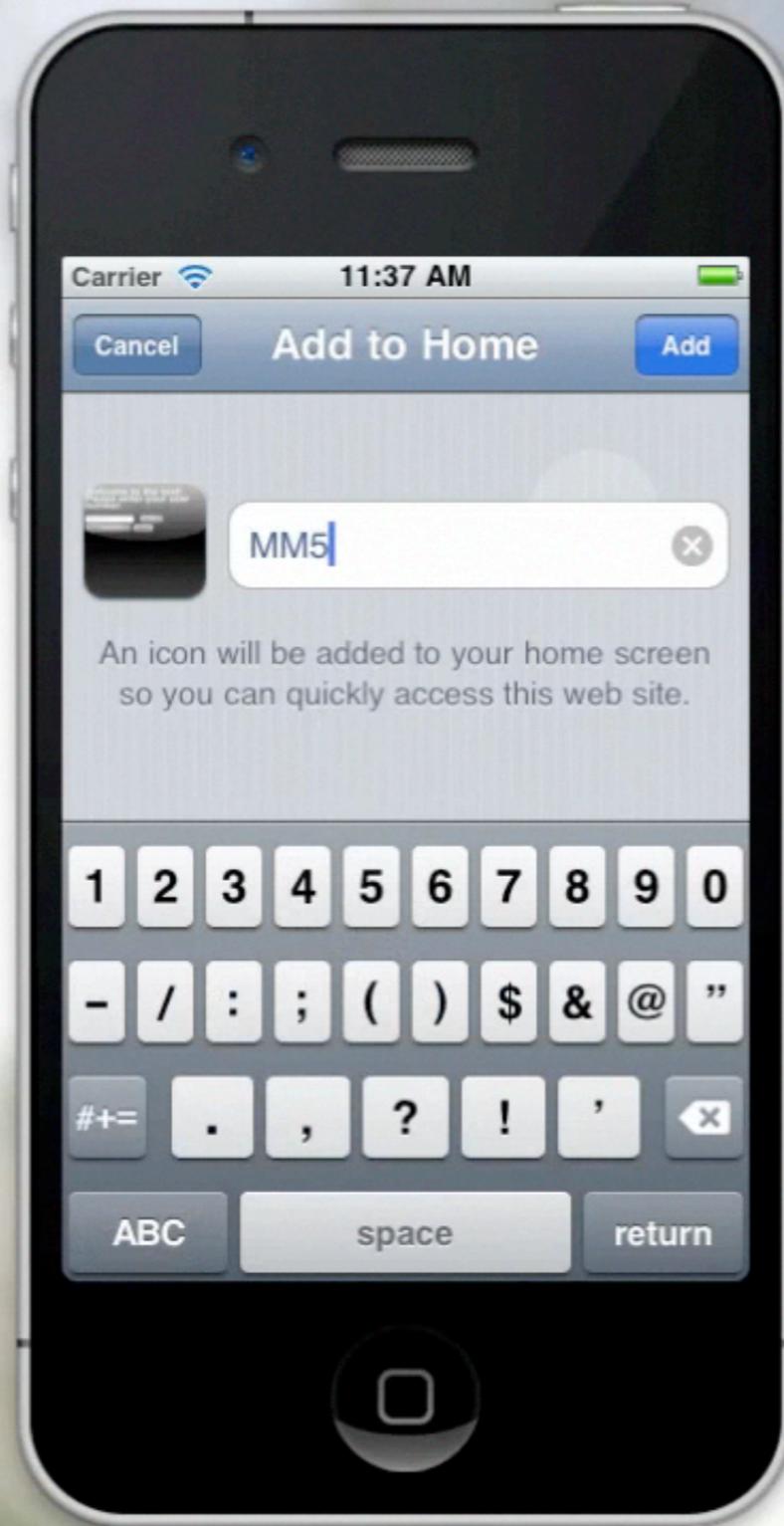
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Multi-Touch gestures

- App Store
- App Home screens
- Full screen apps
- Auto save
- Apps resume when launched

WE LET THEM HOLD THE DEVICES

- upright monitors don't work
experiment
- we shouldn't force a fixed



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