

#WWDC19

# Designing Audio-Haptic Experiences

Hugo Verweij, Sound Designer  
Camille Moussette, Interaction Designer

#WWDC19

# Designing Audio-Haptic Experiences

Hugo Verweij, Sound Designer  
Camille Moussette, Interaction Designer

What is an Audio Haptic experience?

What is an Audio Haptic experience?

Three guiding principles

What is an Audio Haptic experience?

Three guiding principles

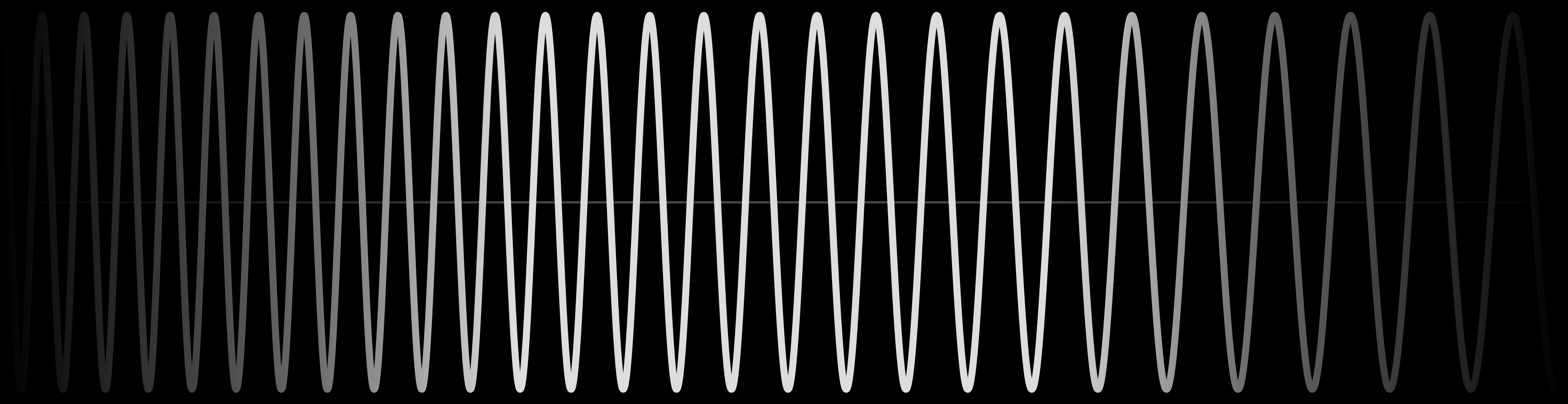
Techniques

What is an Audio Haptic experience?

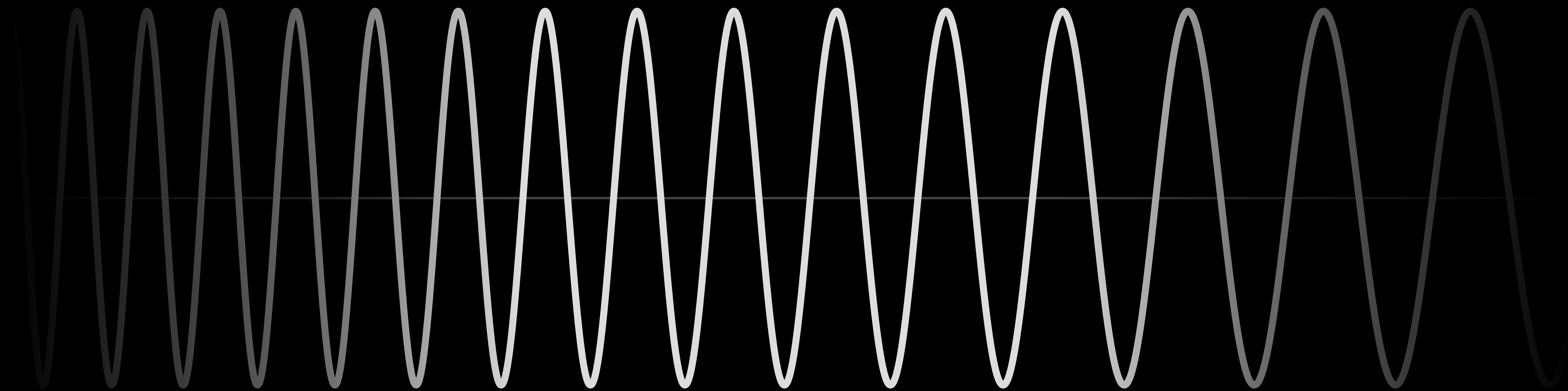
Three guiding principles

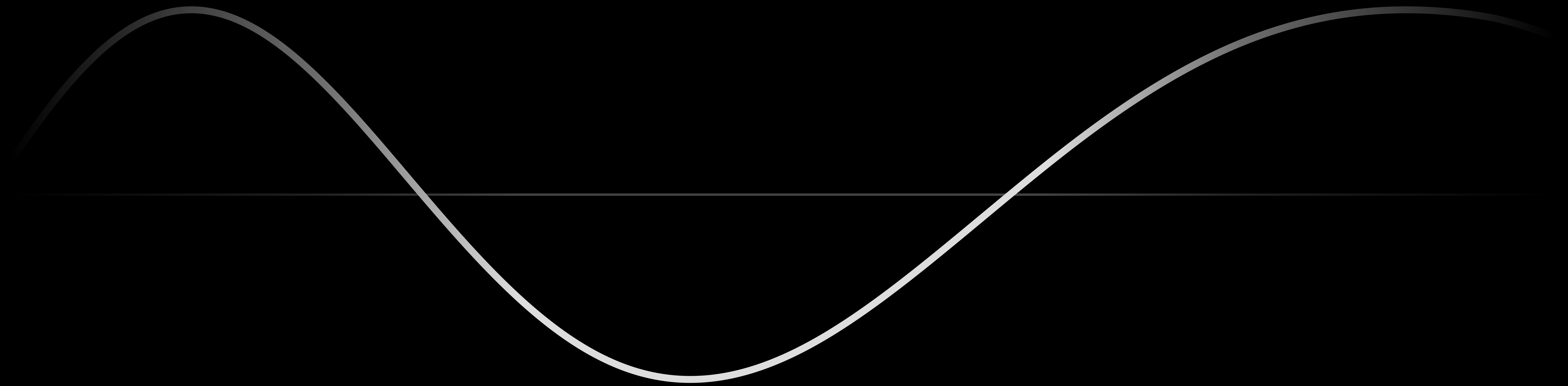
Techniques

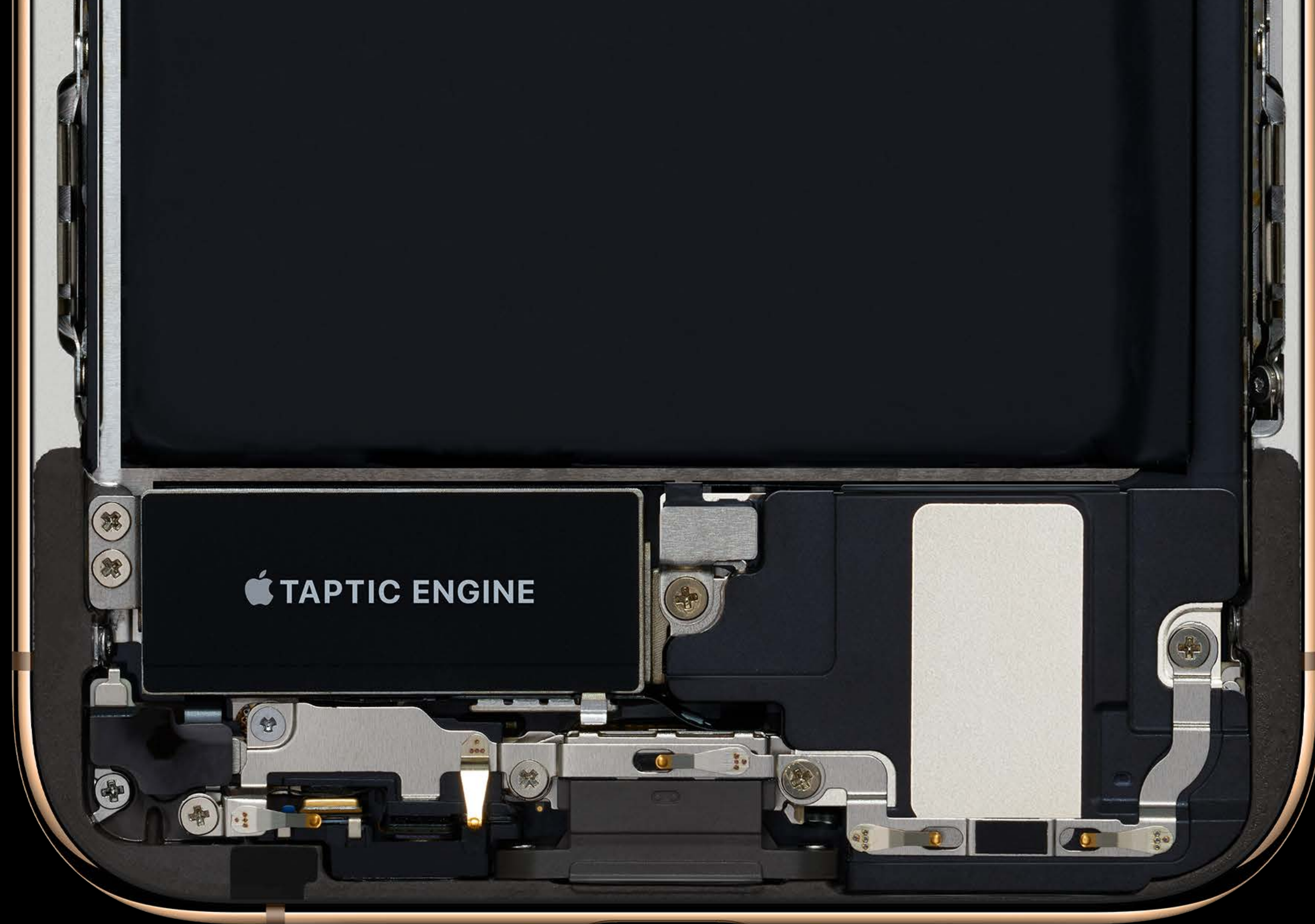








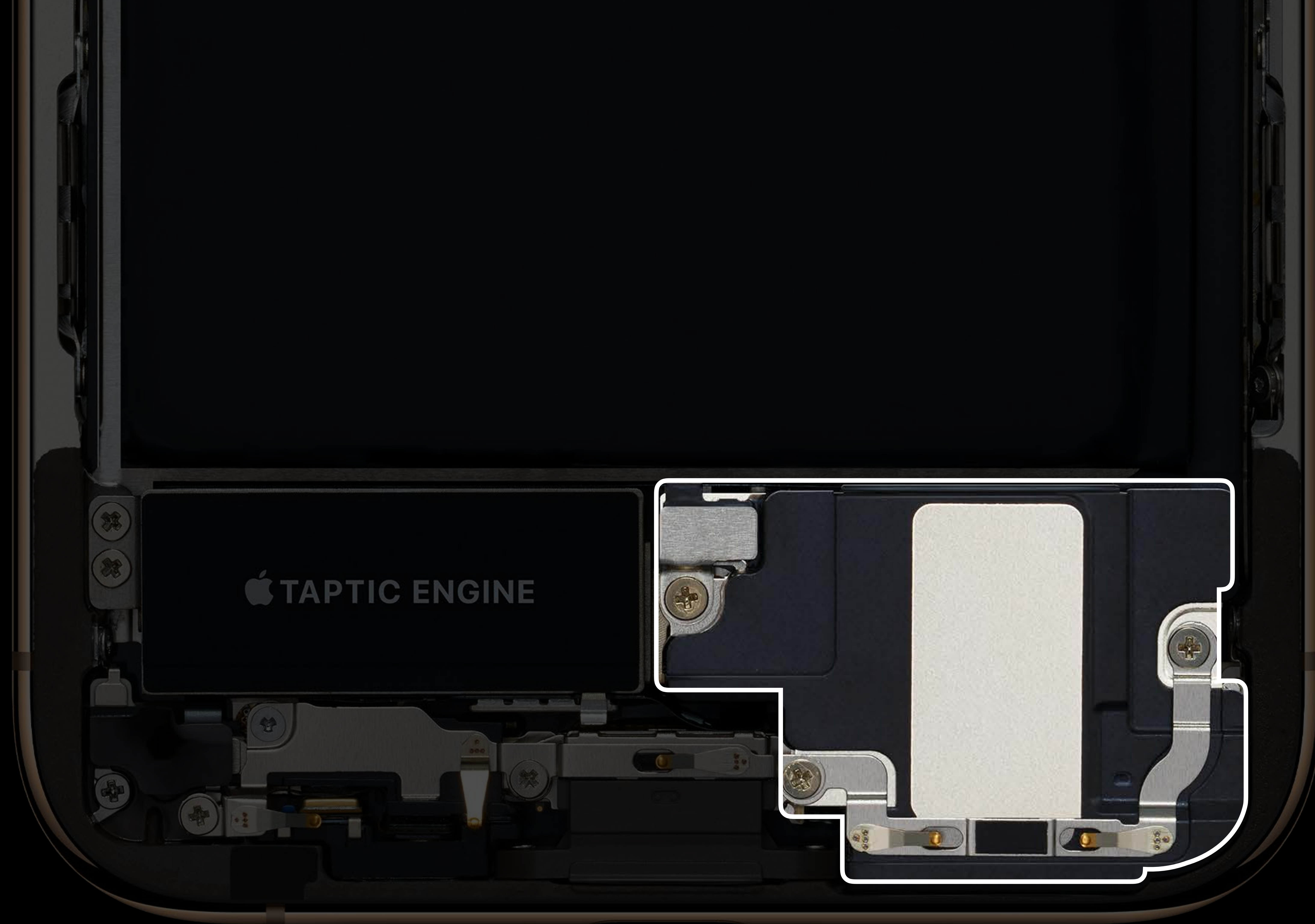




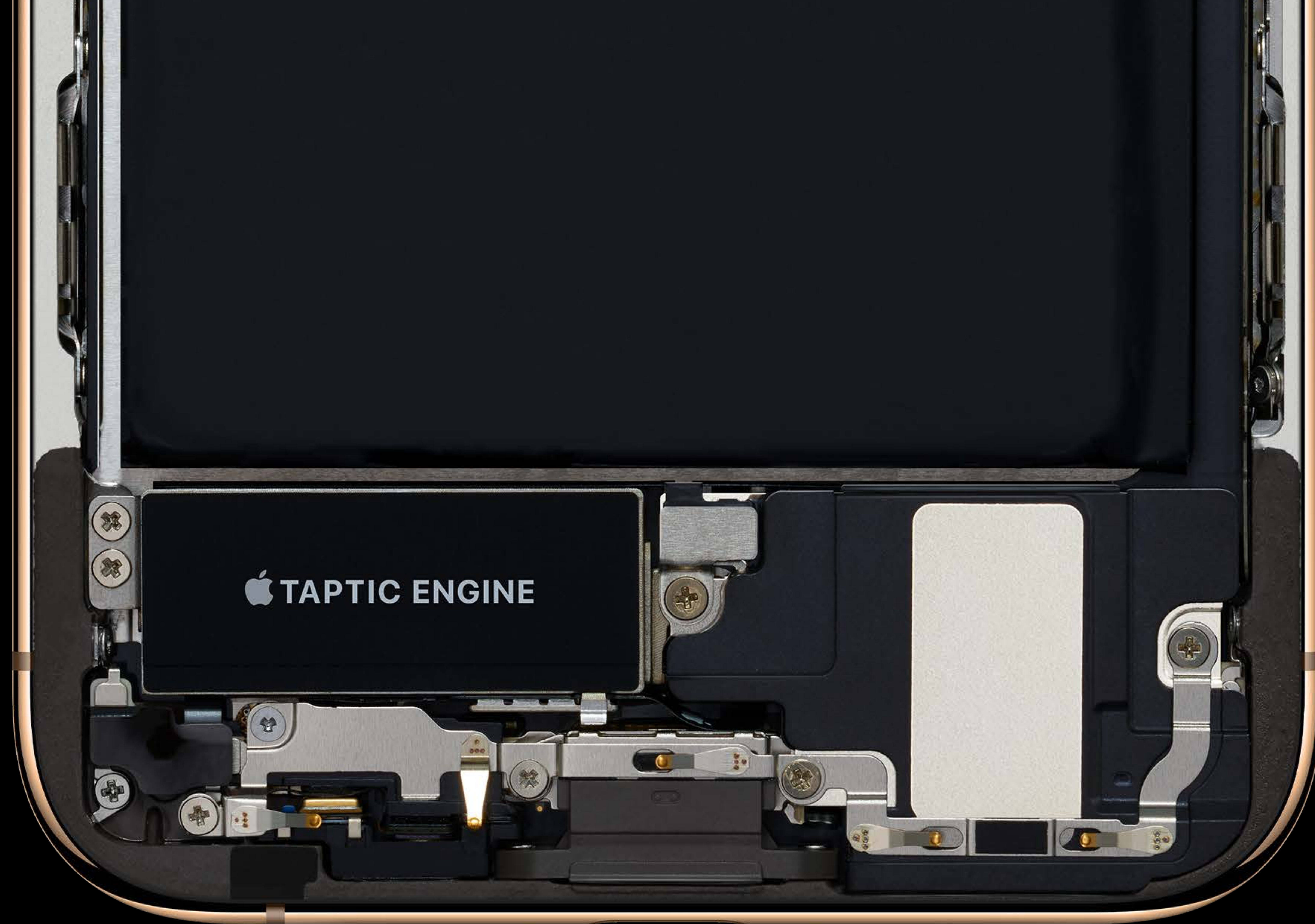
Apple TAPTIC ENGINE



Apple TAPTIC ENGINE

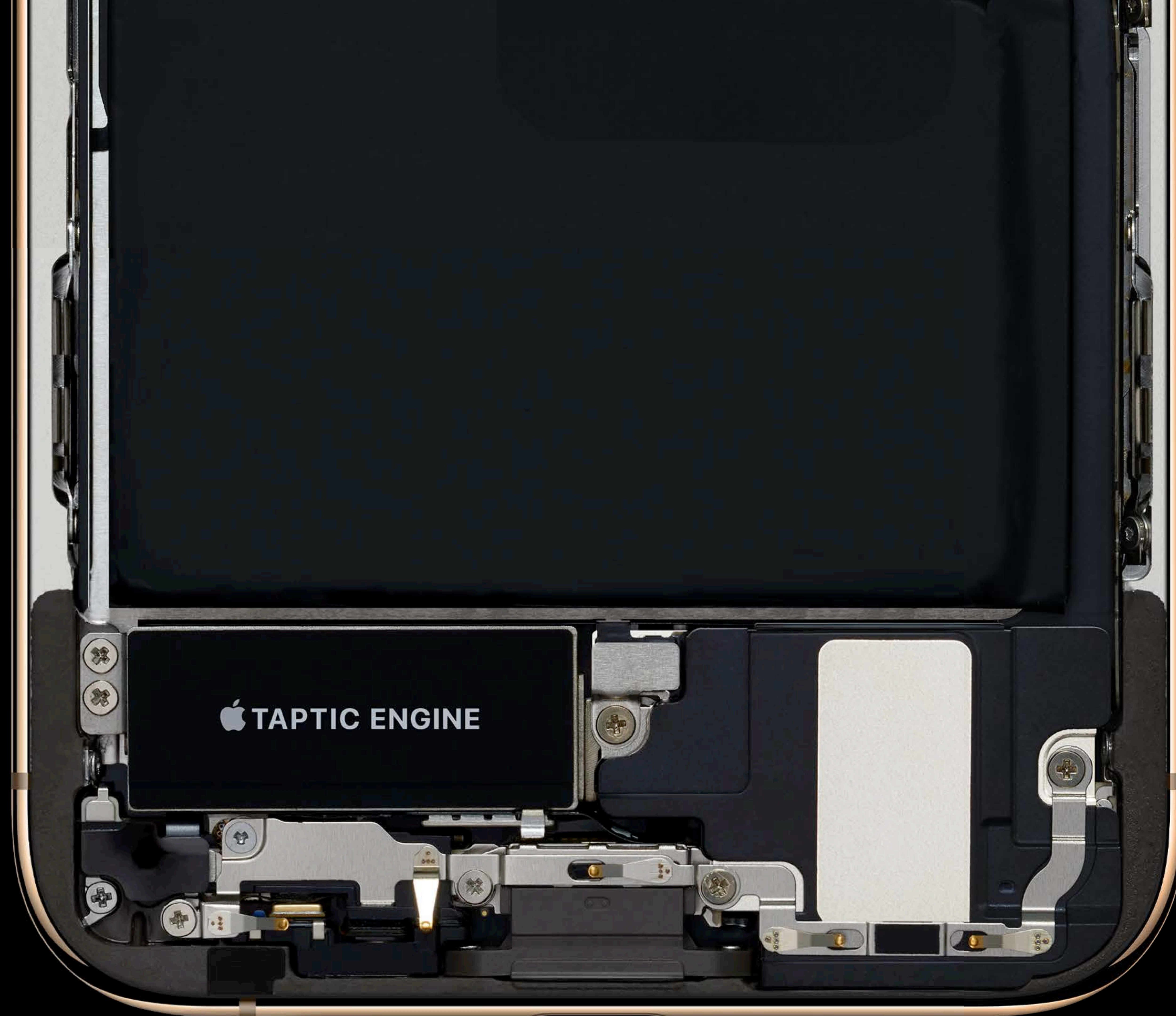


Apple TAPTIC ENGINE



Apple TAPTIC ENGINE

Can you feel it?

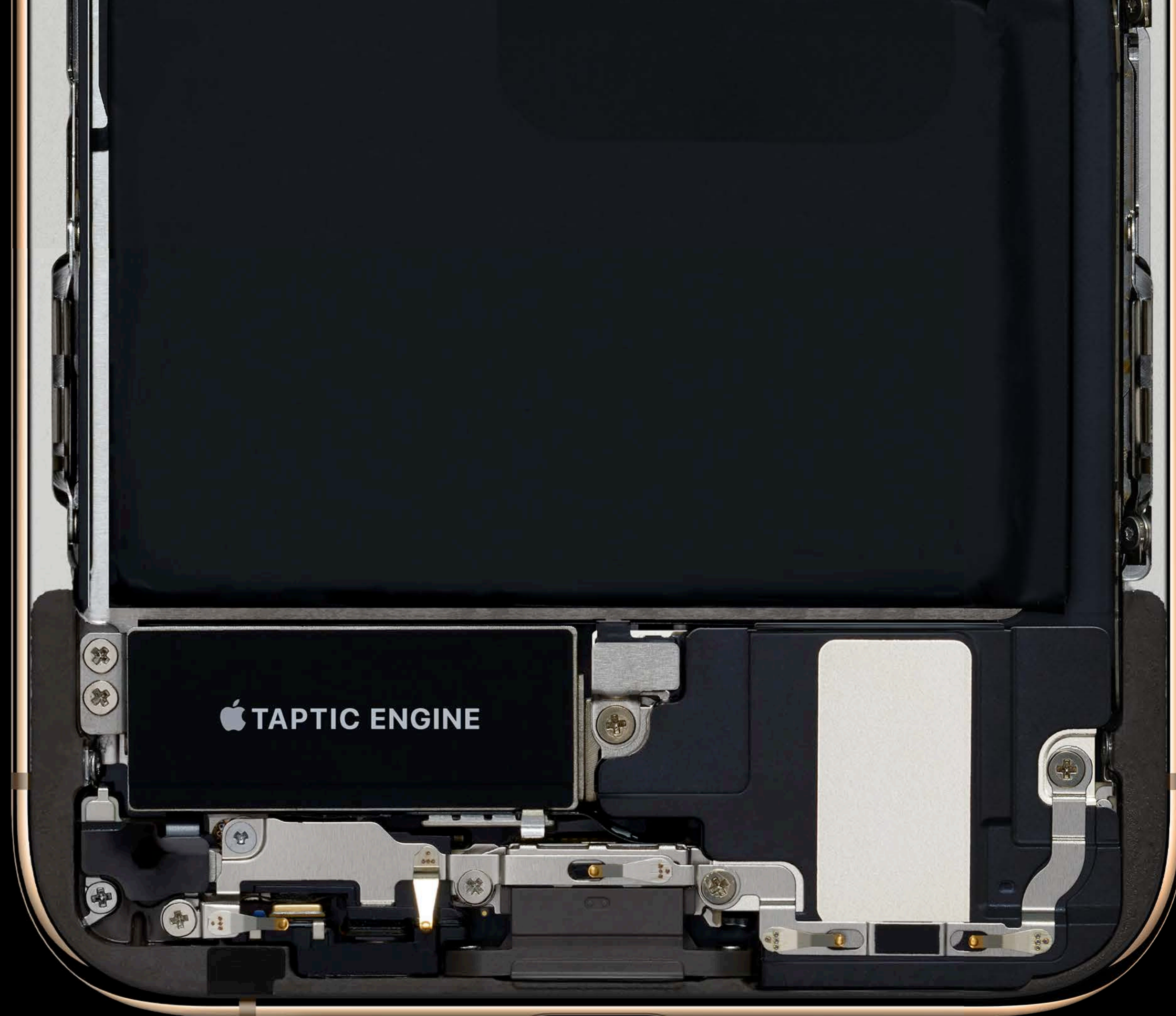


Apple TAPTIC ENGINE





Apple TAPTIC ENGINE

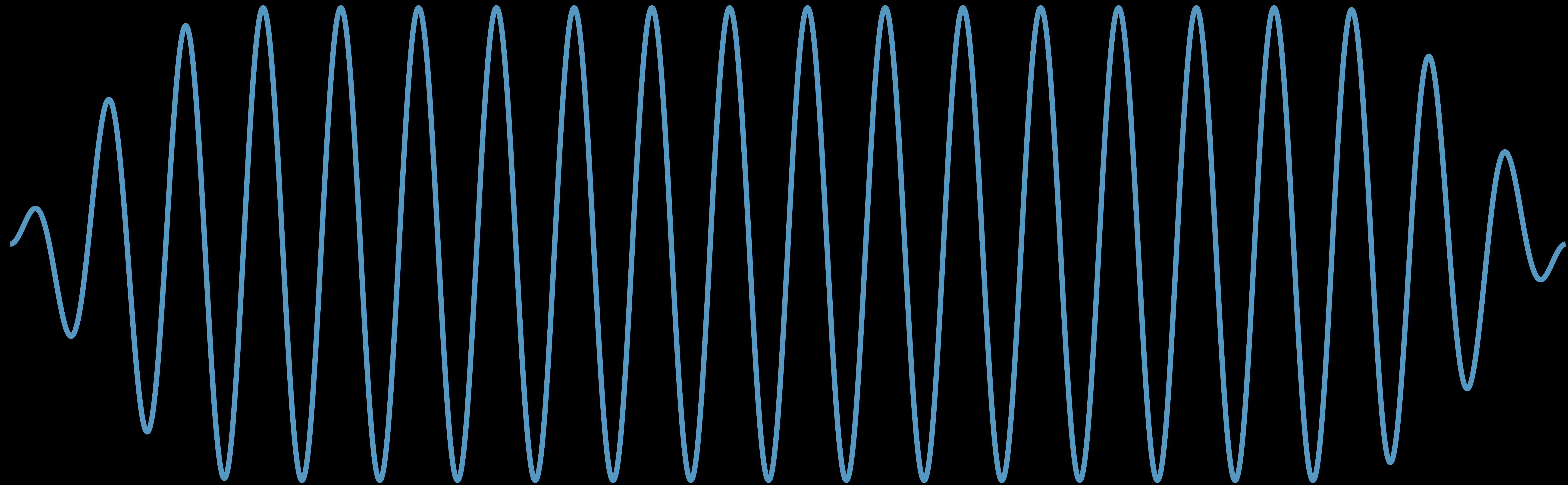


Apple TAPTIC ENGINE

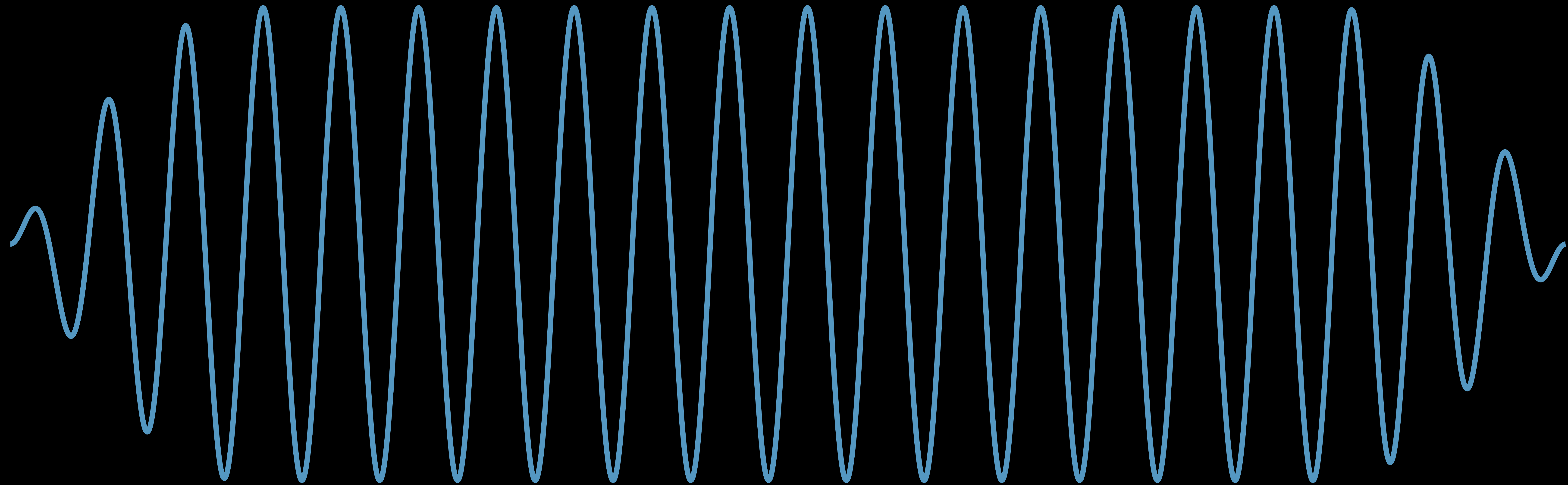
# Core Haptics

# Haptic Design 101

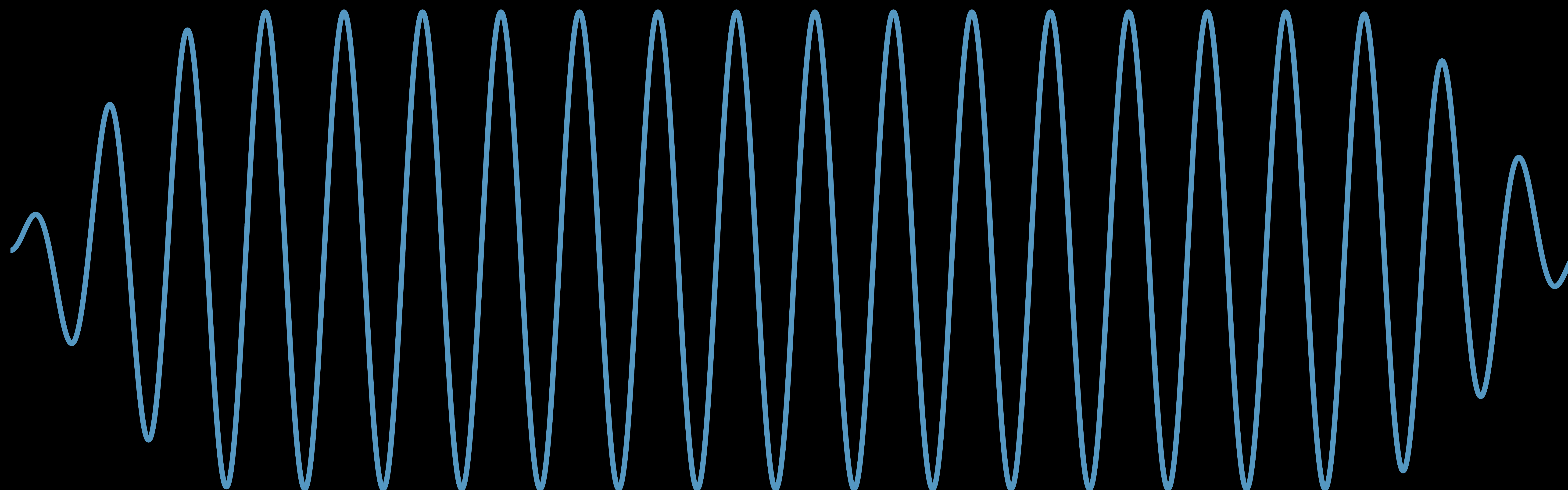
# Haptic Design 101



# Haptic Design 101

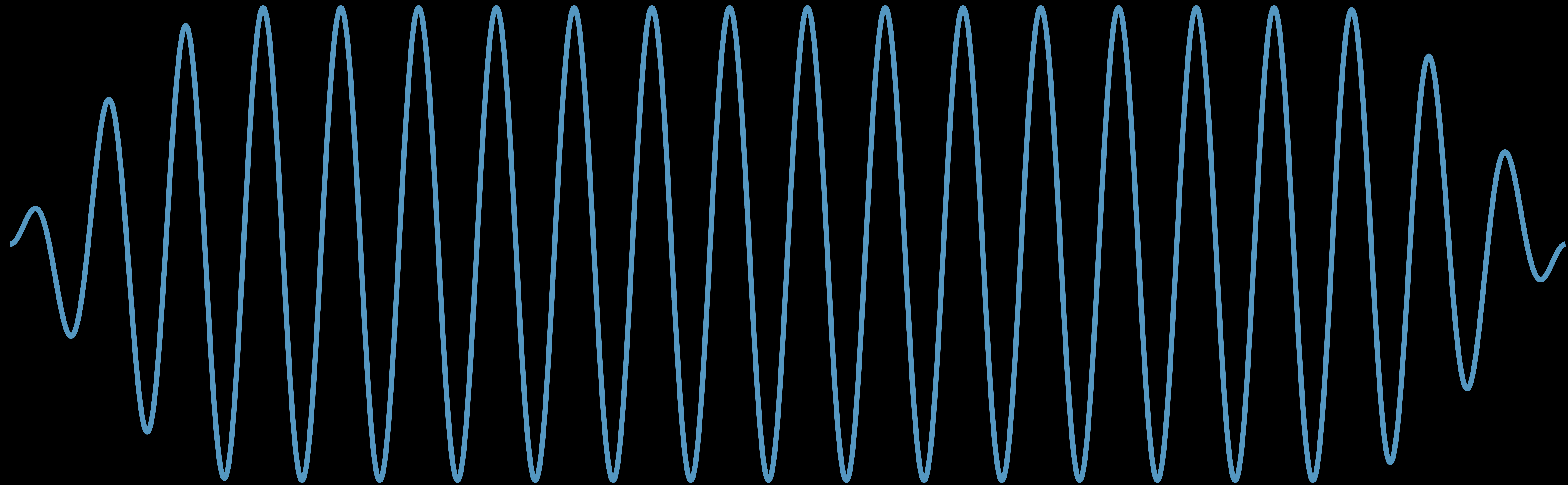


# Haptic Design 101



**Continuous**

# Haptic Design 101

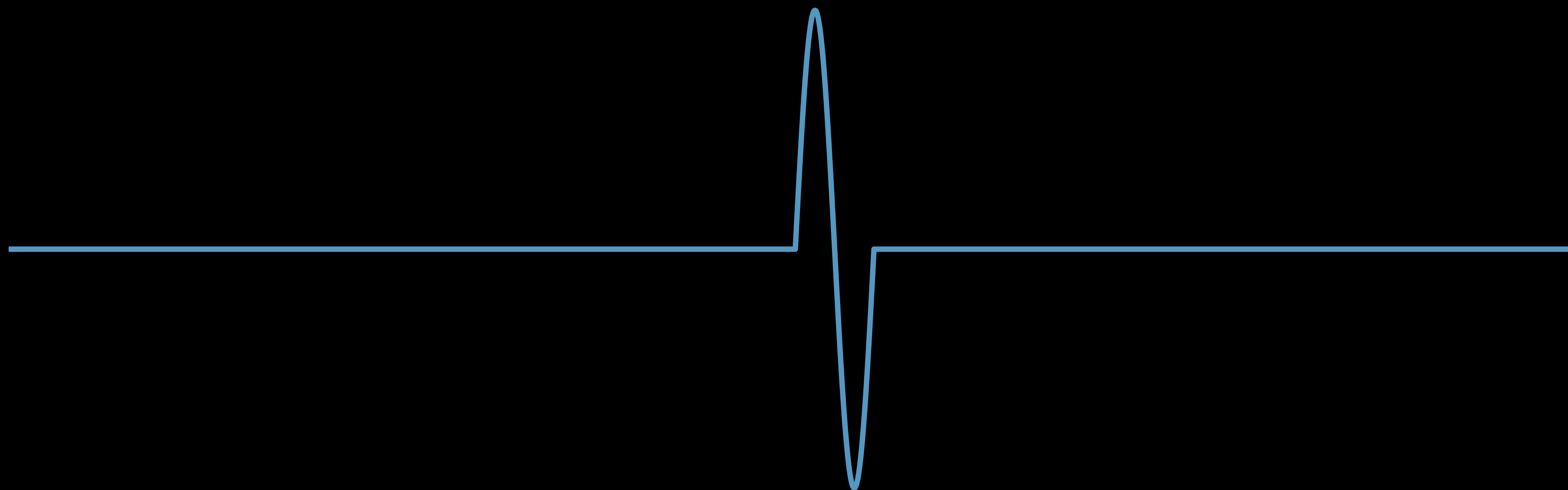




# Haptic Design 101

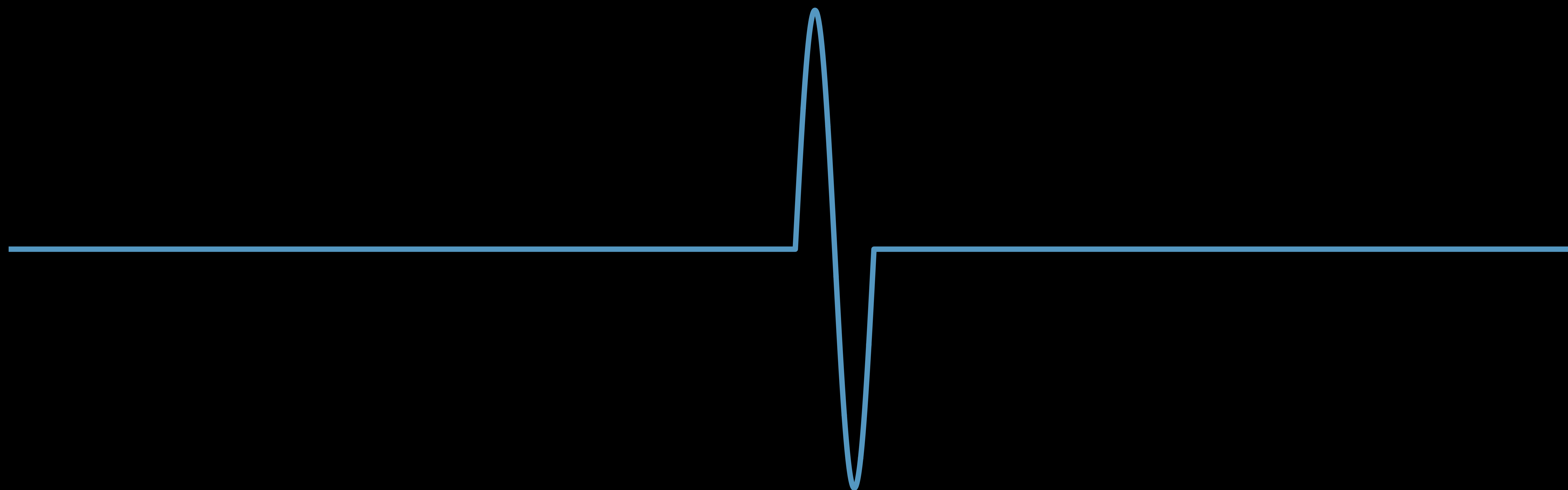


# Haptic Design 101



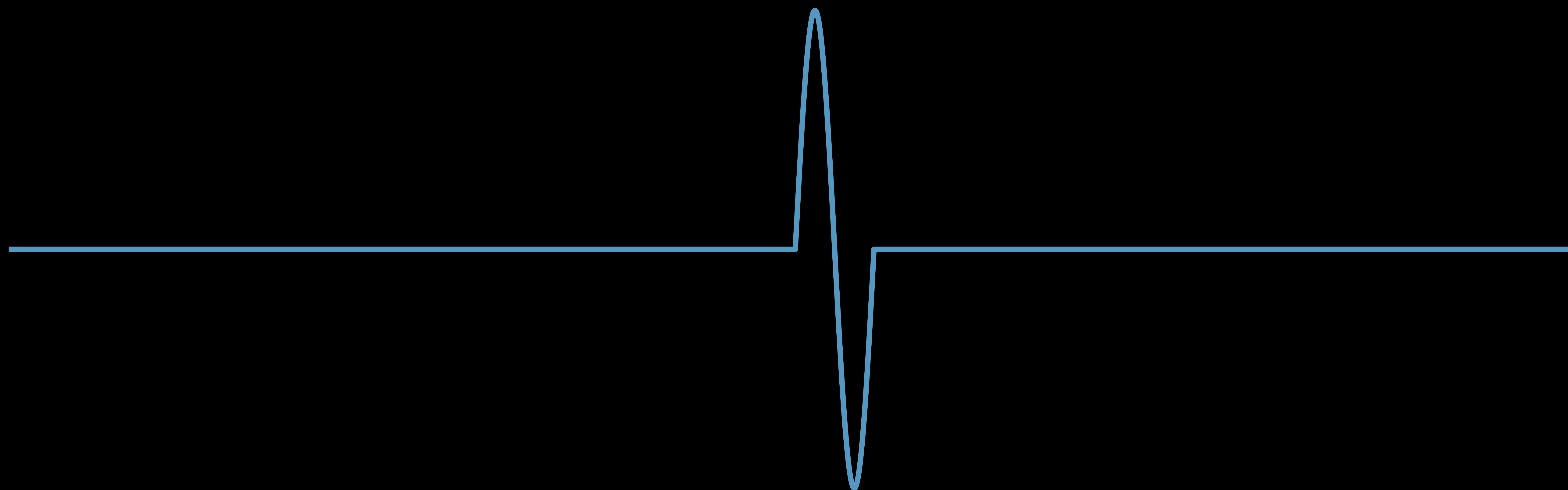
**Transient**

# Haptic Design 101



**Transient**

# Haptic Design 101



**Transient**

# Haptic Design 101



**Transient**

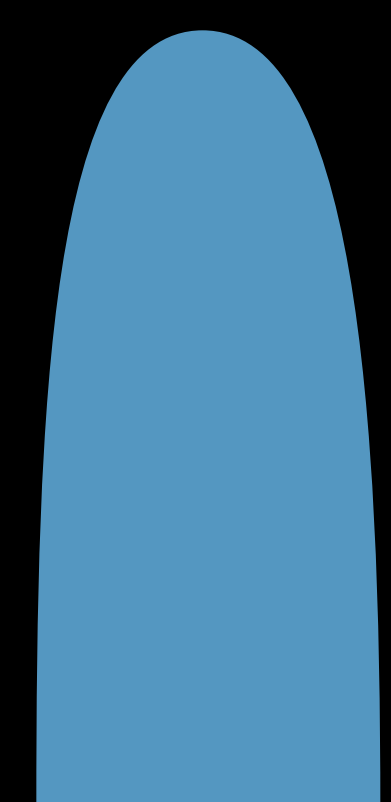
# Haptic Design 101



**Transient**

# Haptic Design 101

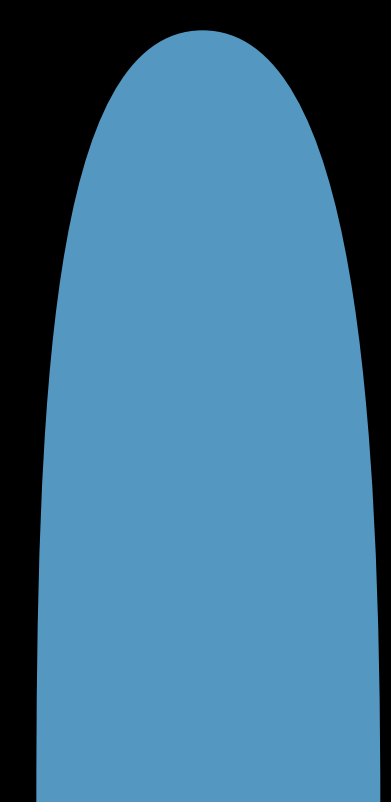
Round, Soft



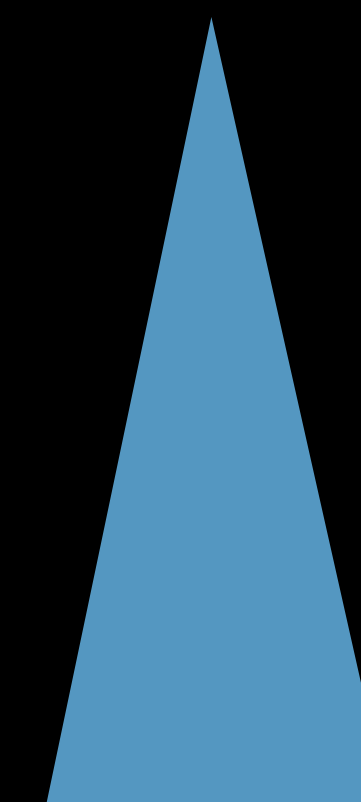
**Transient**

# Haptic Design 101

Round, Soft



Crisp, Precise

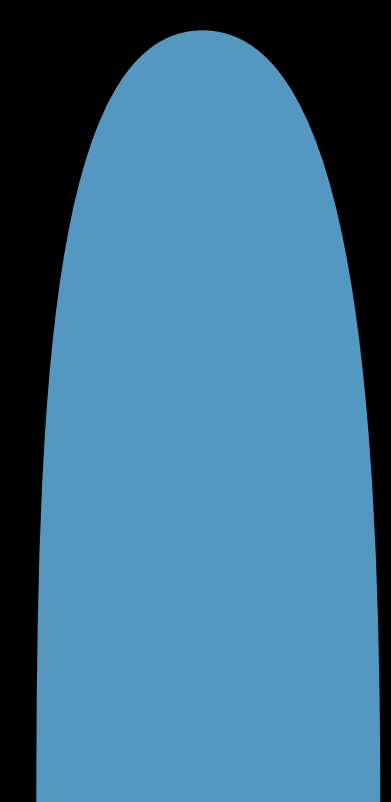


Transient

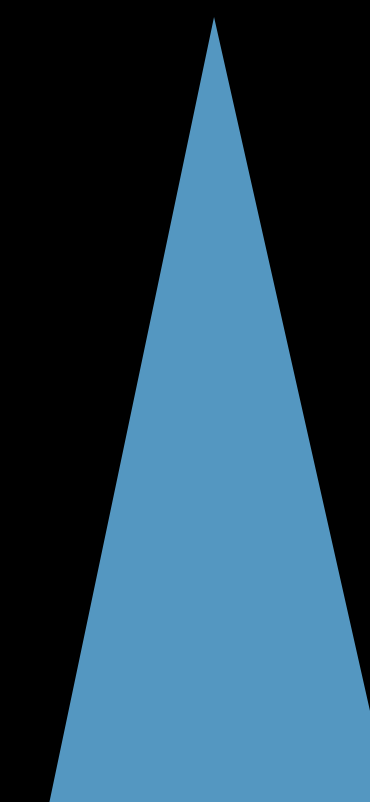


# Haptic Design 101

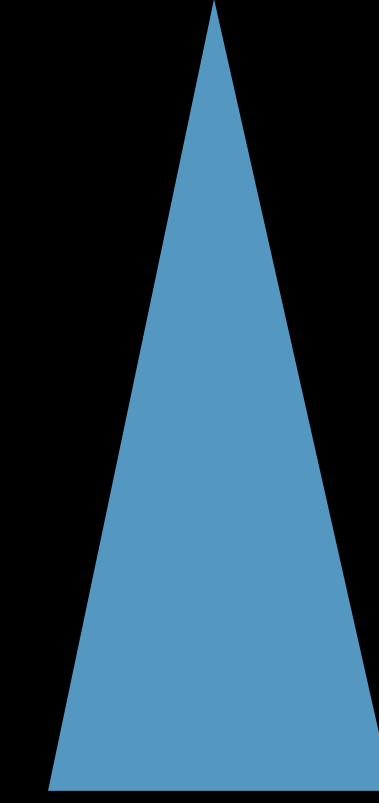
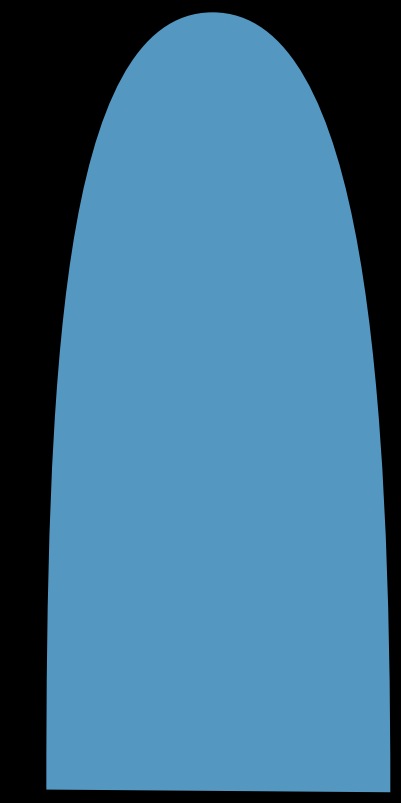
Round, Soft



Crisp, Precise

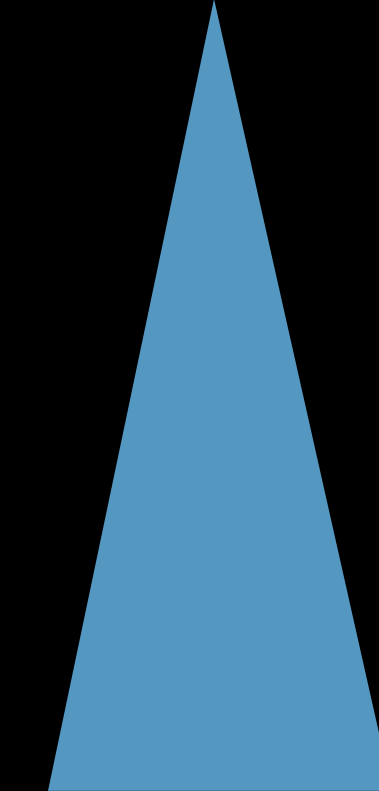
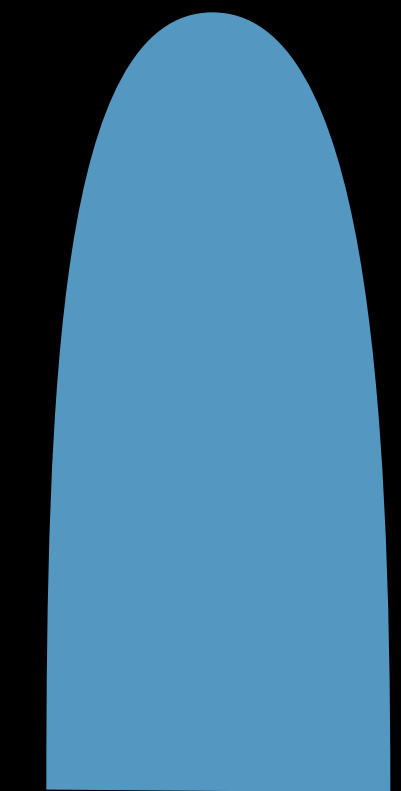


# Haptic Design 101

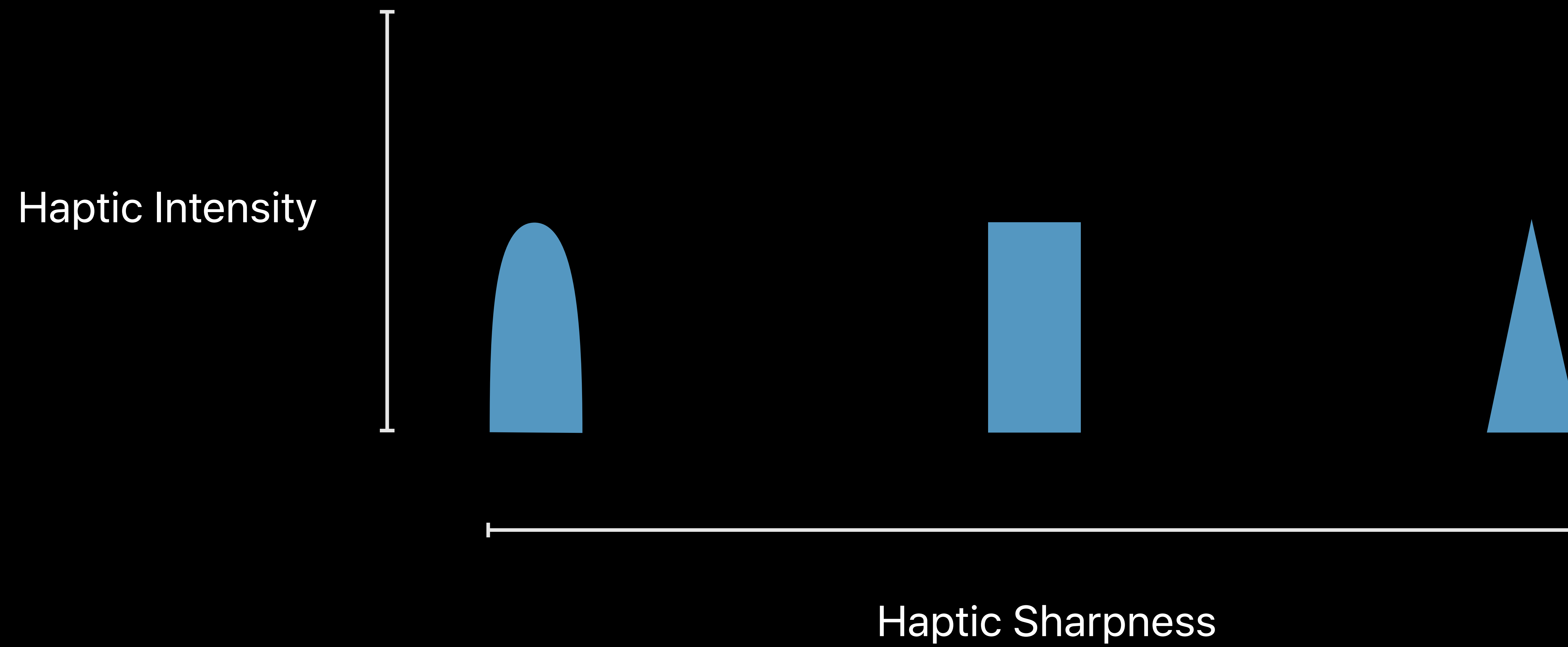


# Haptic Design 101

Haptic Intensity



# Haptic Design 101



# Haptic Design 101

What is an Audio Haptic experience?

Three guiding principles

Techniques

# Three Guiding Principles

# Three Guiding Principles

Causality



# Three Guiding Principles

Causality

Harmony

# Three Guiding Principles

Causality

Harmony

Utility

**Causality**

# Causality

“For feedback to be useful, it must be obvious what caused it.”





**Cause**

**Effect**

**Cause**

Foot colliding with the ball

**Effect**



**Cause**

Foot colliding with the ball

**Effect**

Sound of impact  
Feel of impact

# Cause and Effect

# Cause and Effect

Qualities of interacting objects

# Cause and Effect

Qualities of interacting objects

Dynamics of the interaction

# Cause and Effect

Qualities of interacting objects

Dynamics of the interaction

Environment











DEBIT

**VISA**

•••• 1234

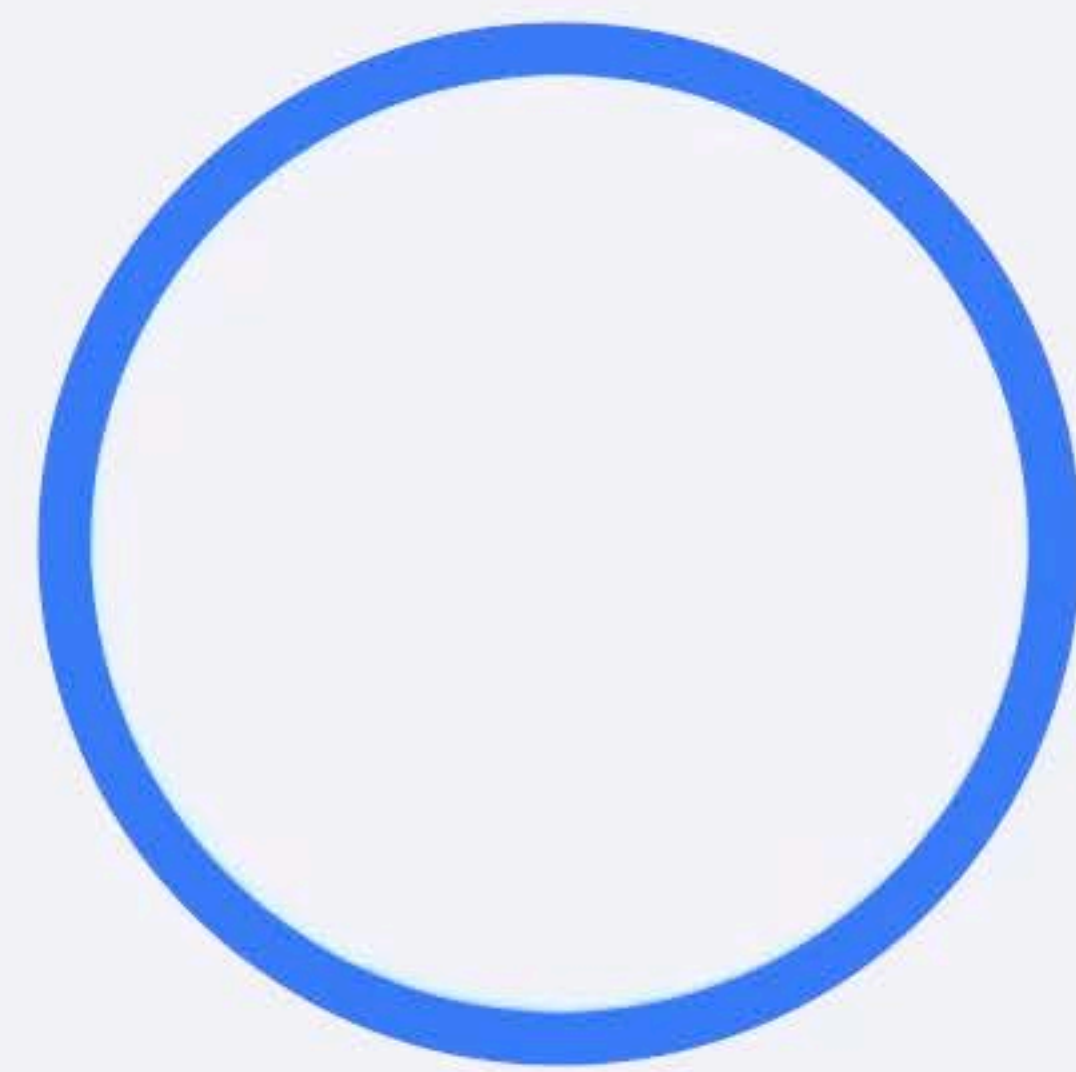




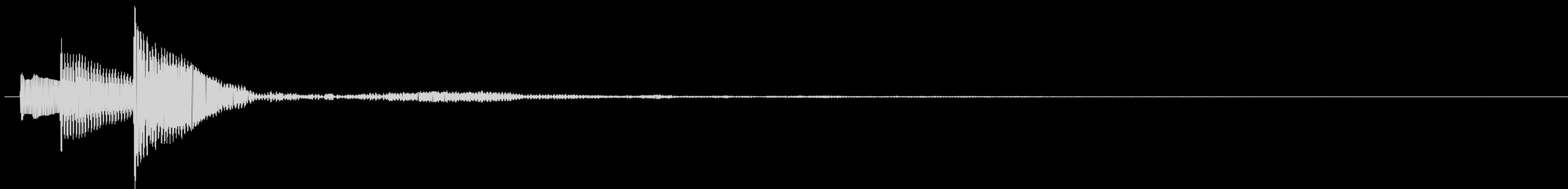
DEBIT

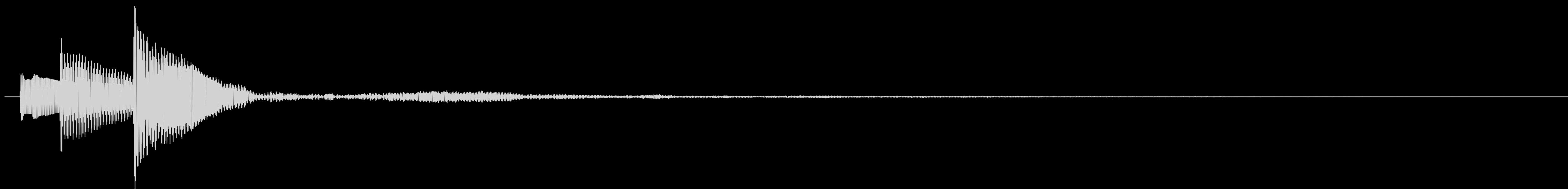
**VISA**

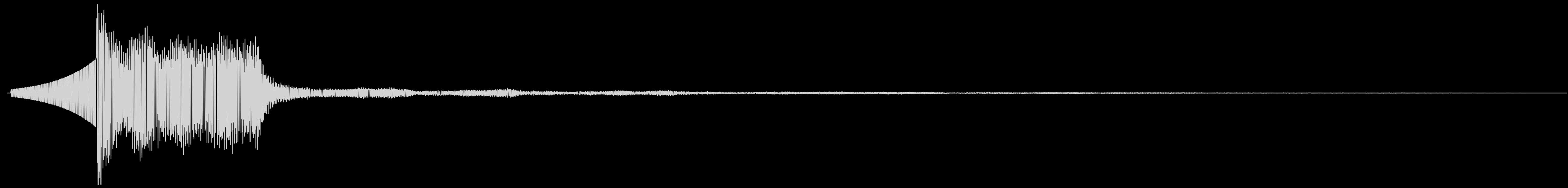
•••• 1234

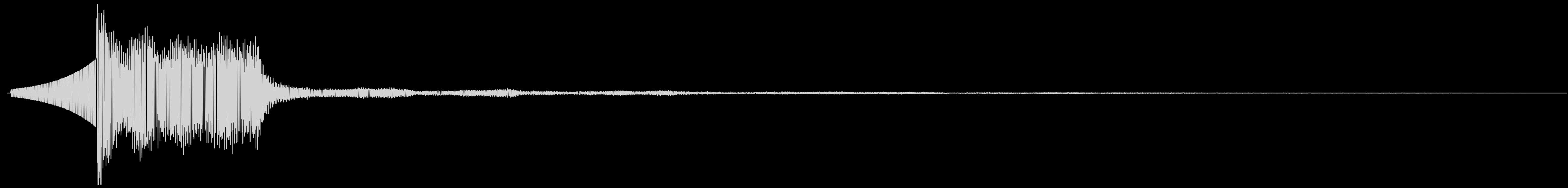


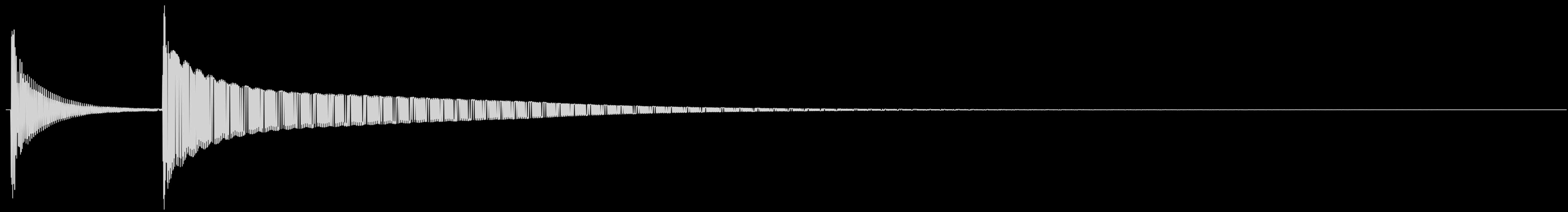




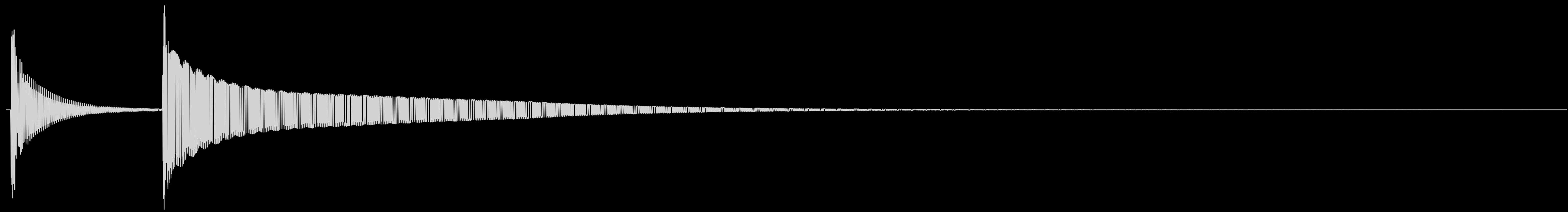










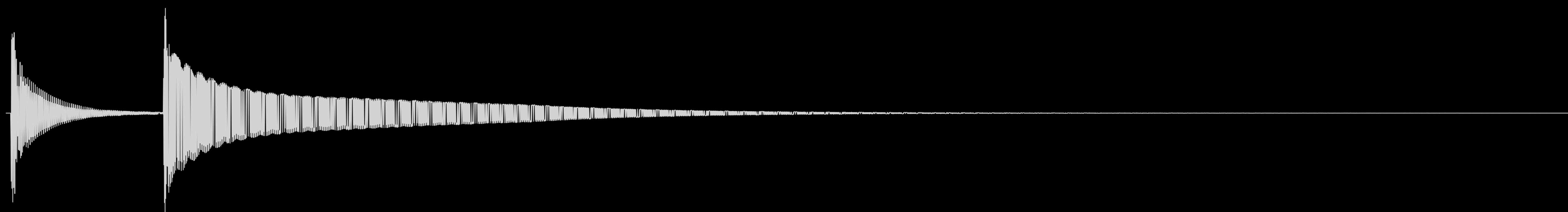


Sound

Haptic



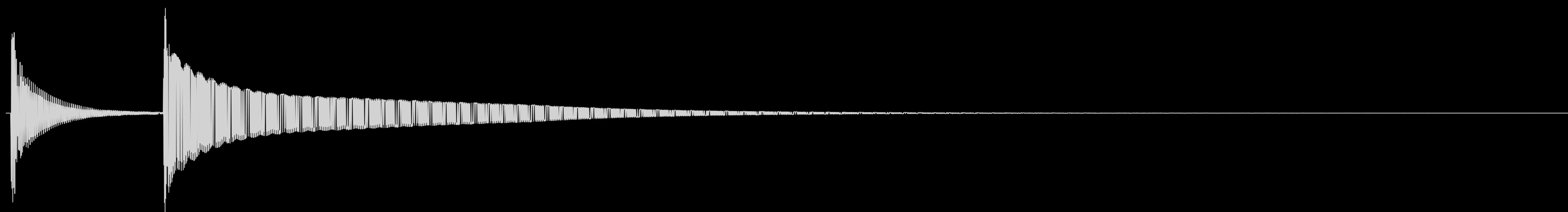
Sound



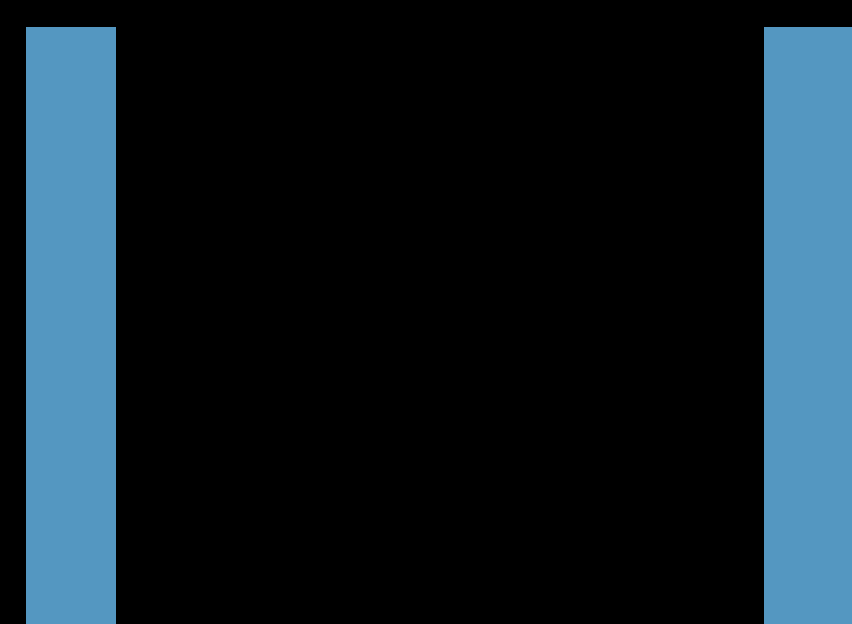
Haptic



Sound



Haptic

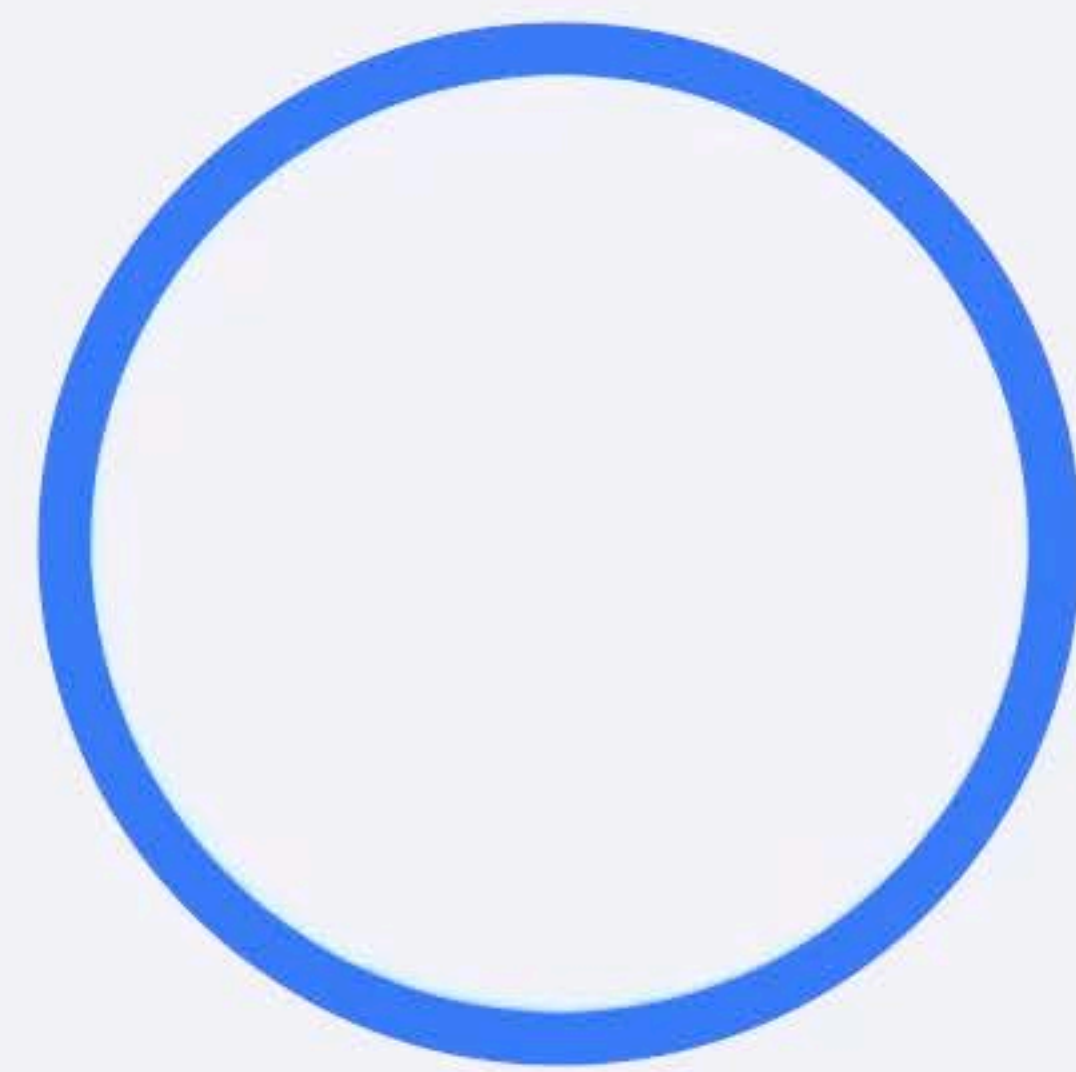




DEBIT

•••• 1234

**VISA**

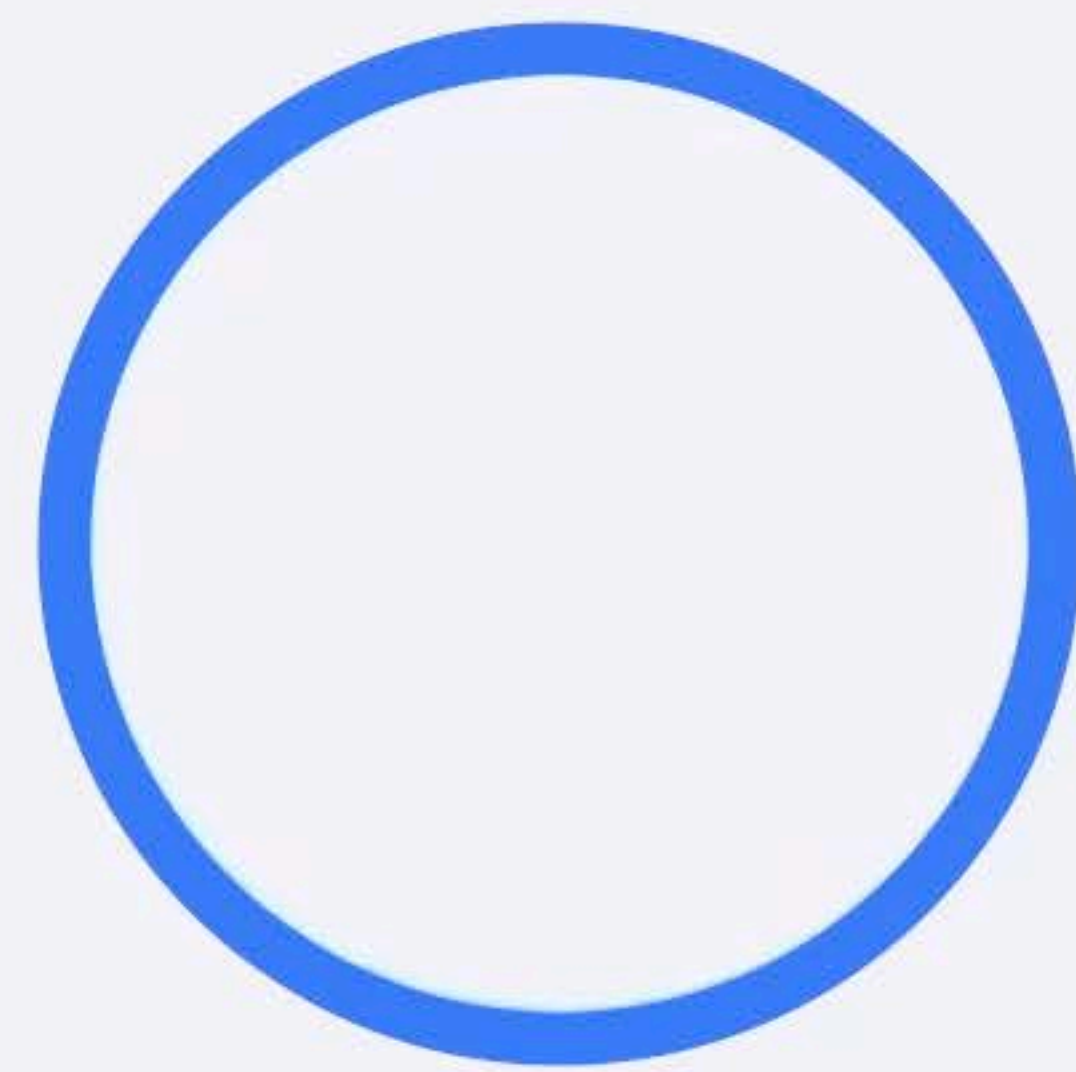




DEBIT

**VISA**

•••• 1234



**Harmony**

# Harmony

"It feels the way it looks the way it sounds."



**Real World**

**Real World**

Visual

Audio

Haptic

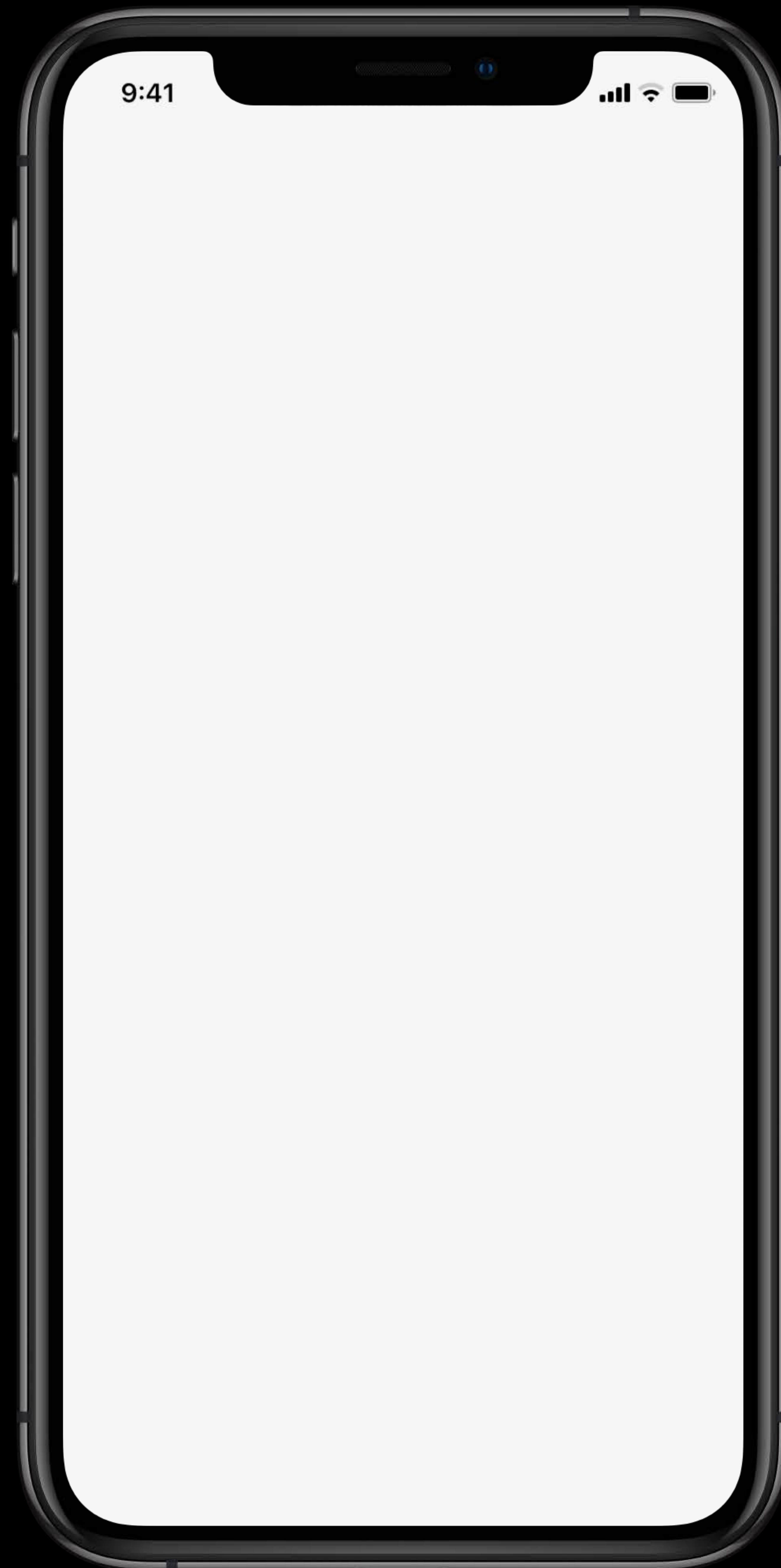
**Real World**

Visual  
Audio  
Haptic

**Digital World**

**Real World**

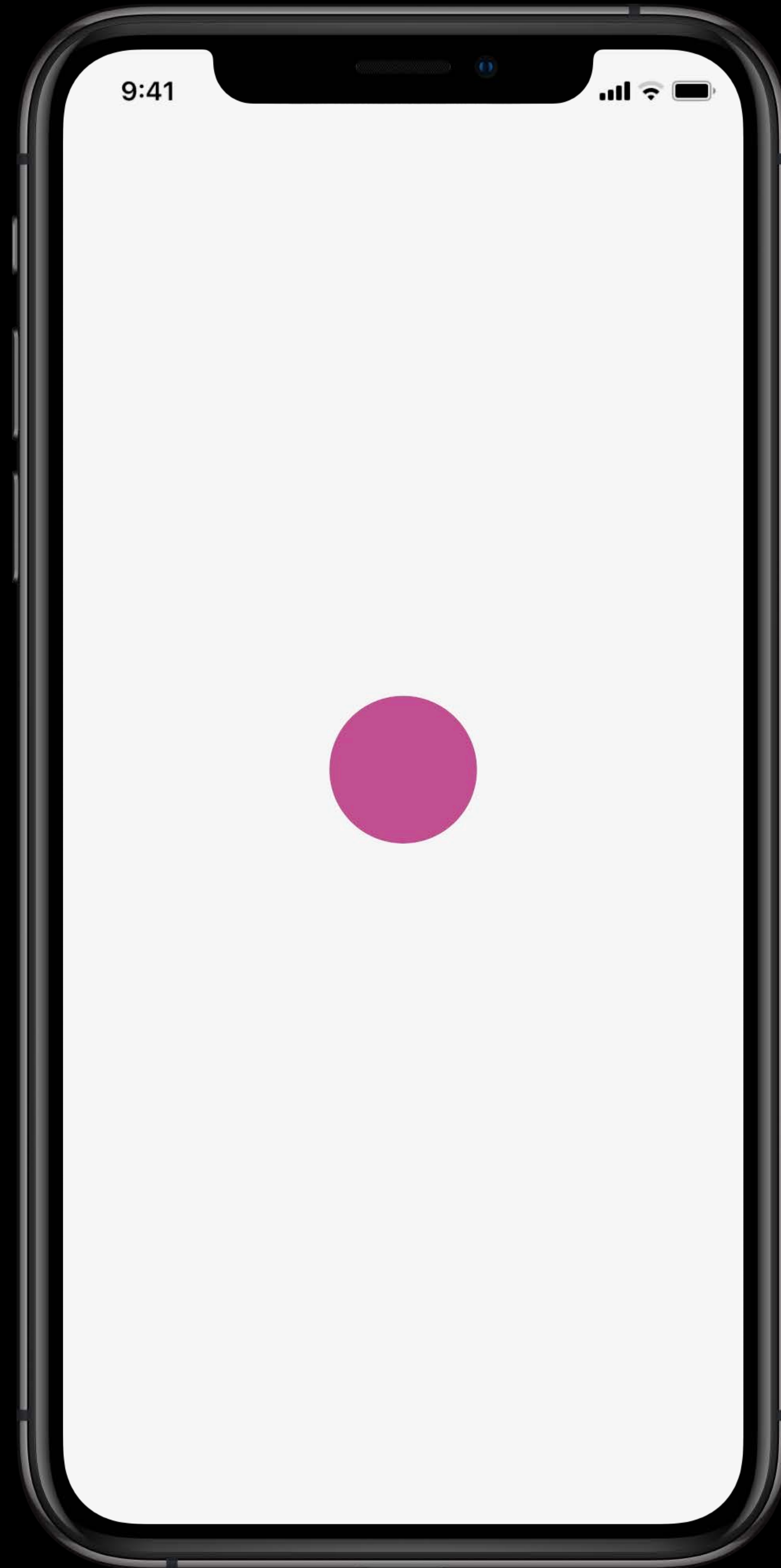
Visual  
Audio  
Haptic



**Digital World**

# Real World

Visual  
Audio  
Haptic

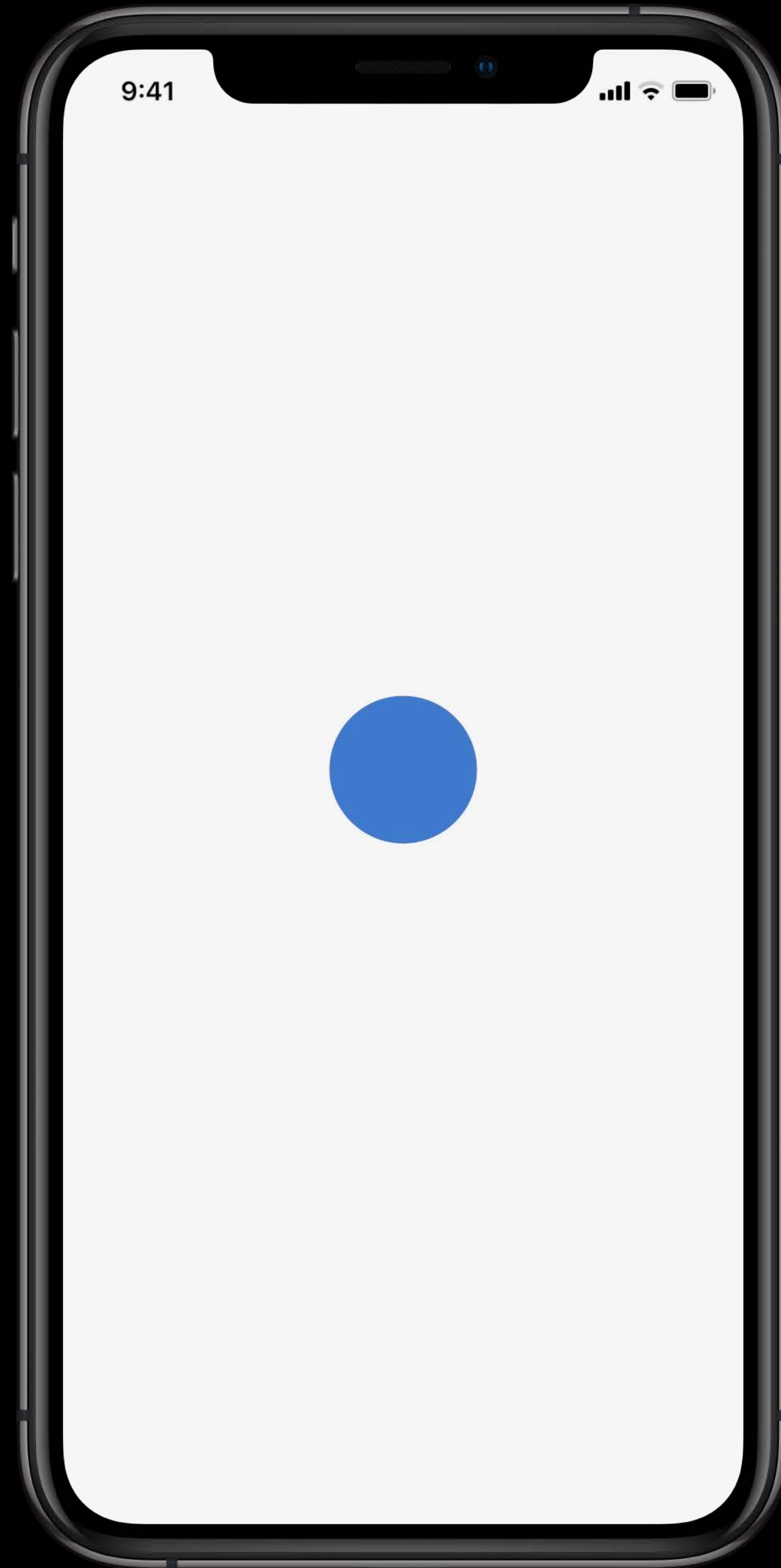


# Digital World

Visual

# Real World

Visual  
Audio  
Haptic

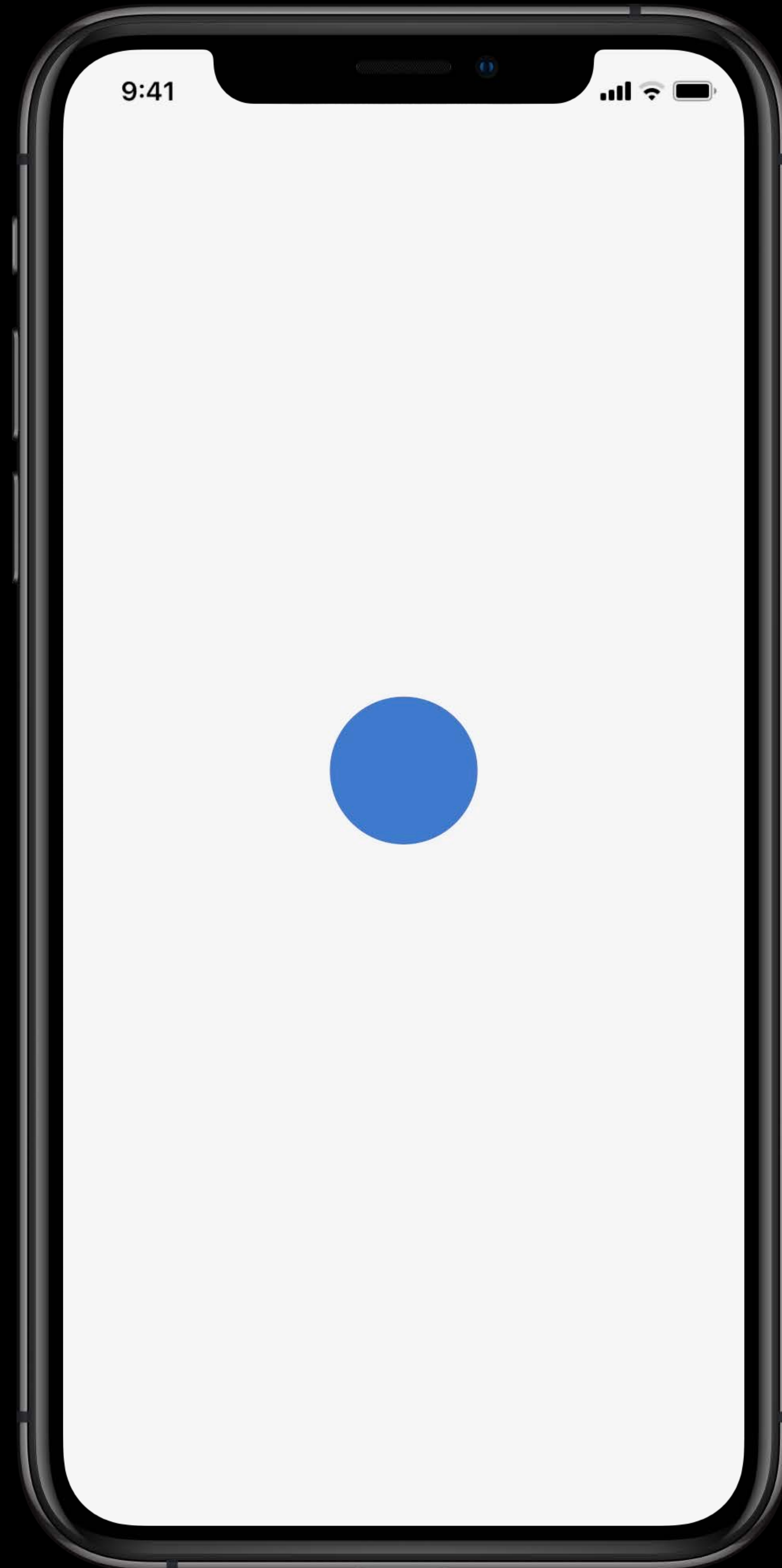


# Digital World

Visual

# Real World

Visual  
Audio  
Haptic

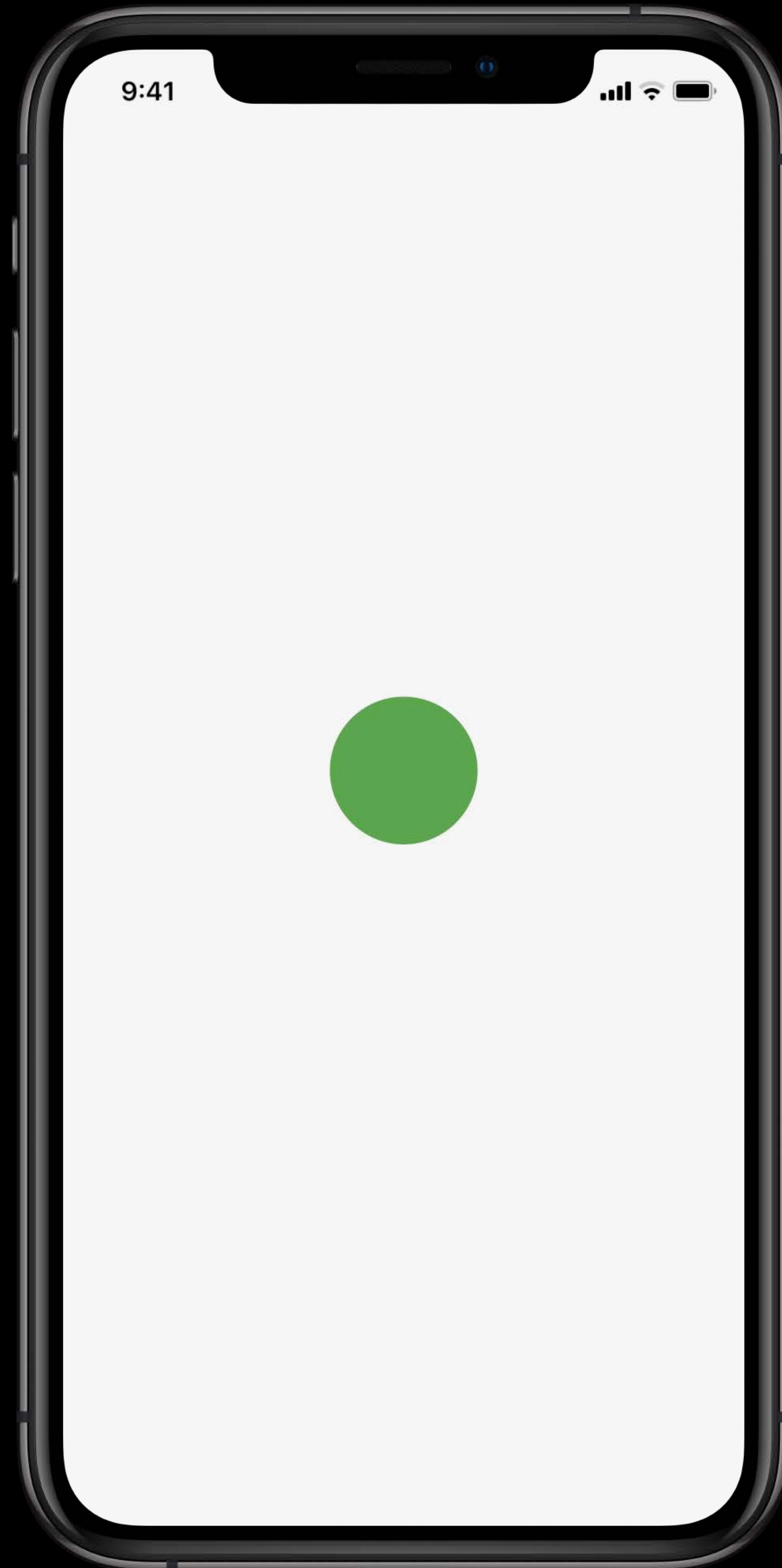


# Digital World

Visual  
Audio

# Real World

Visual  
Audio  
Haptic



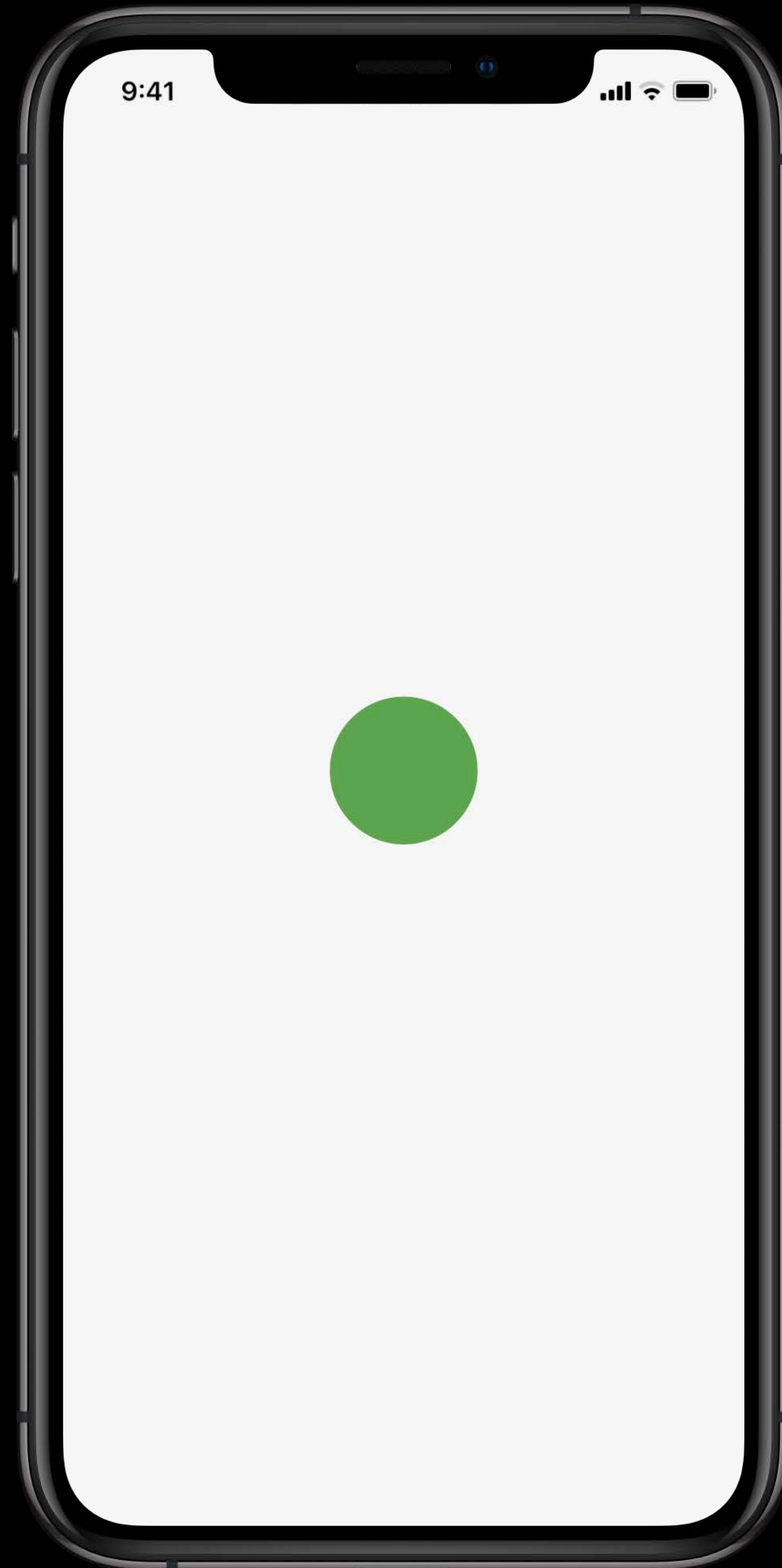
# Digital World

Visual  
Audio



# Real World

Visual  
Audio  
Haptic

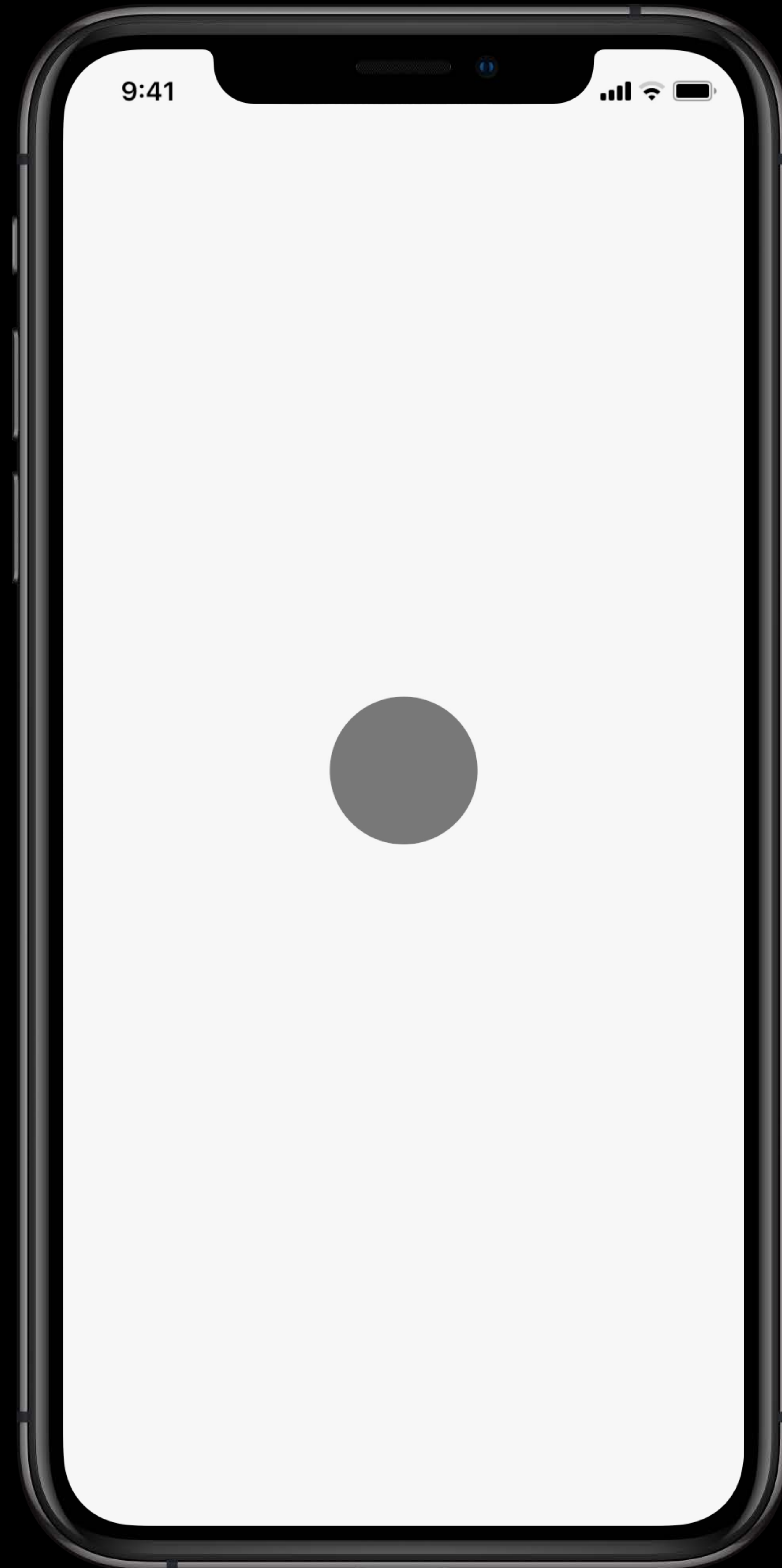


# Digital World

Visual  
Audio  
Haptic

# Real World

Visual  
Audio  
Haptic

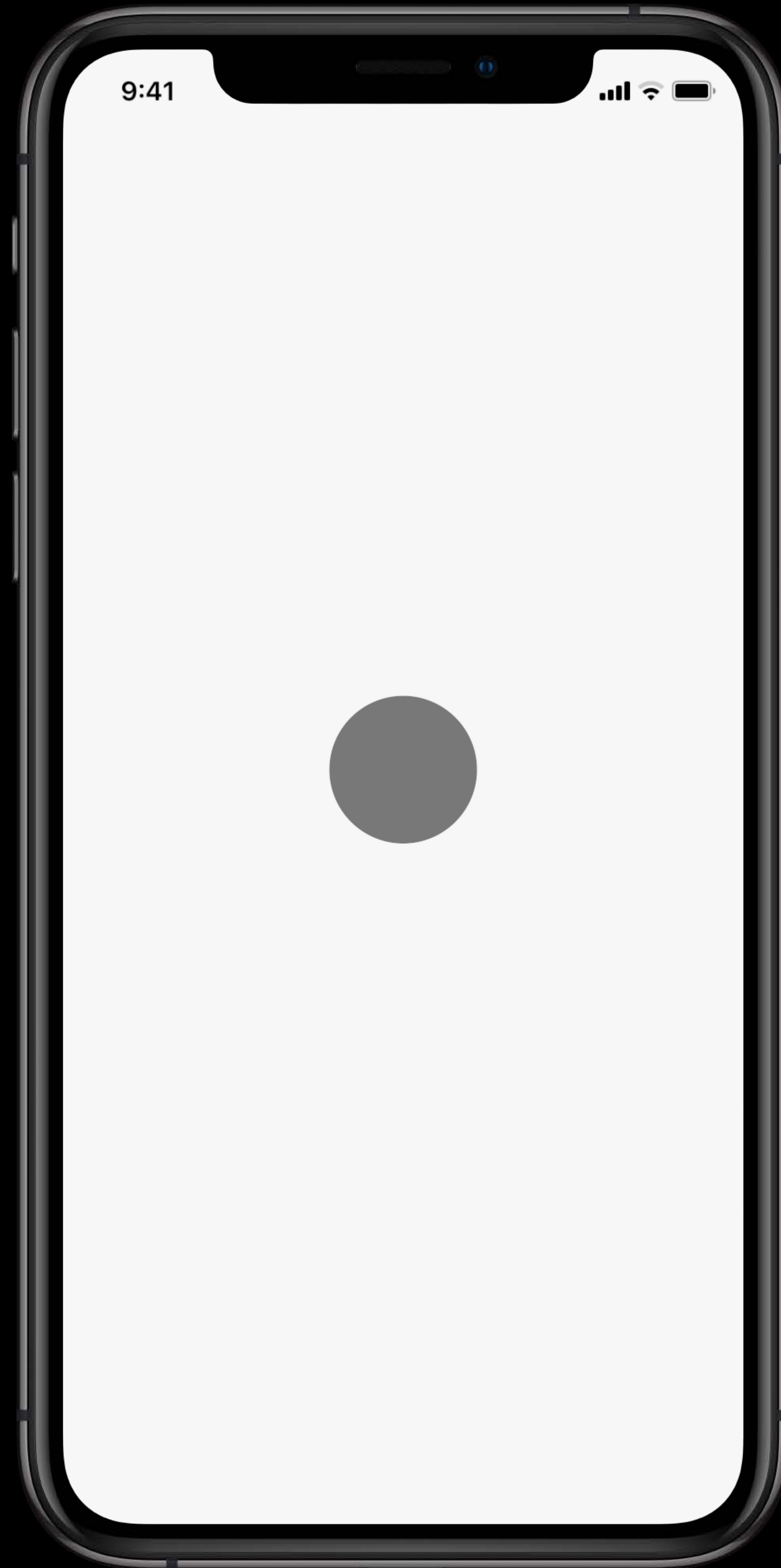


# Digital World

Visual  
Audio  
Haptic

# Real World

Visual  
Audio  
Haptic

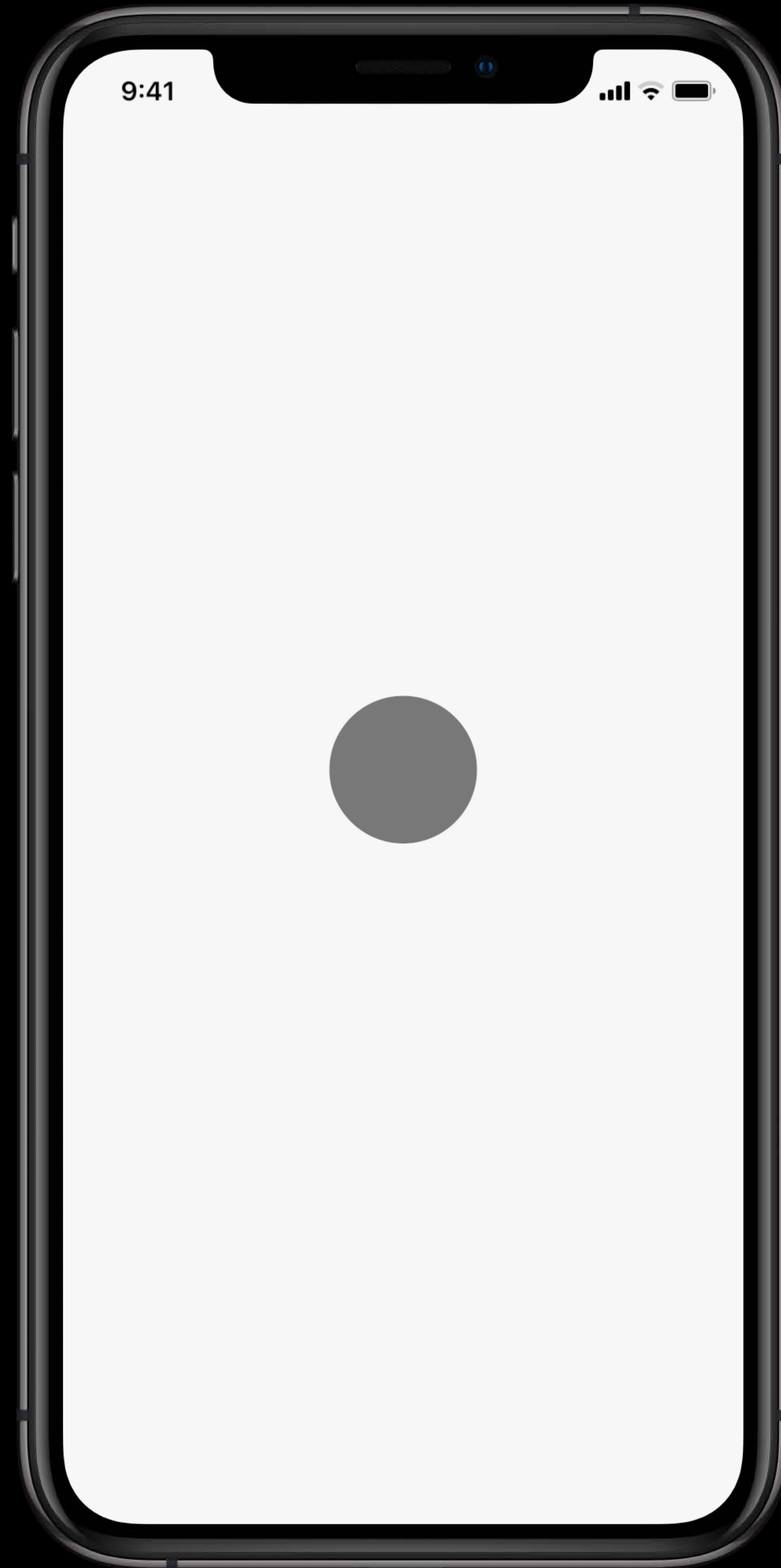


# Digital World

Visual  
Audio  
Haptic  
Synchronization

# Real World

Visual  
Audio  
Haptic



# Digital World

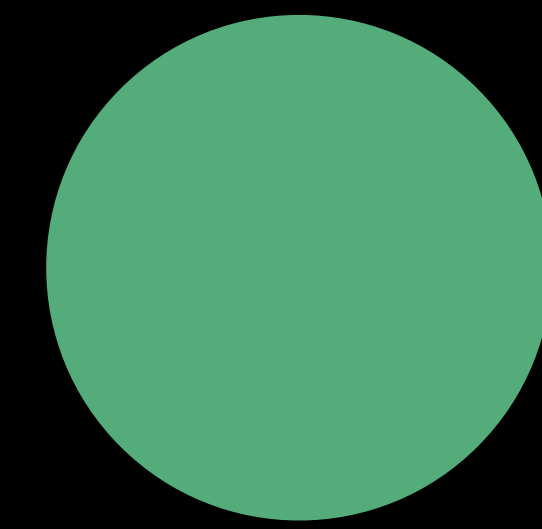
Visual  
Audio  
Haptic  
Synchronization

# Harmony

Interactions, Visuals, Audio and Haptics

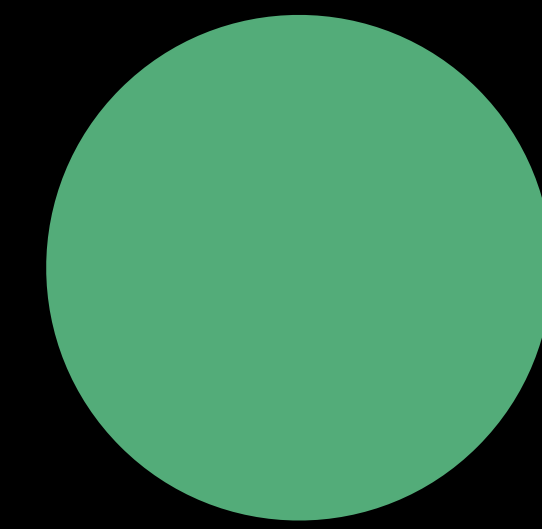
# Harmony

Interactions, Visuals, Audio and Haptics



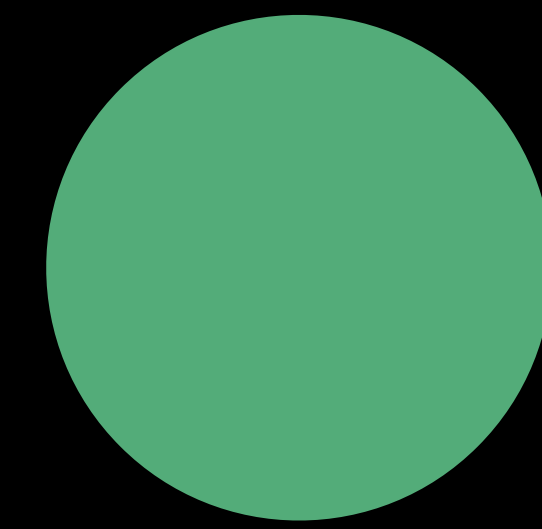
# Harmony

Interactions, Visuals, Audio and Haptics



# Harmony

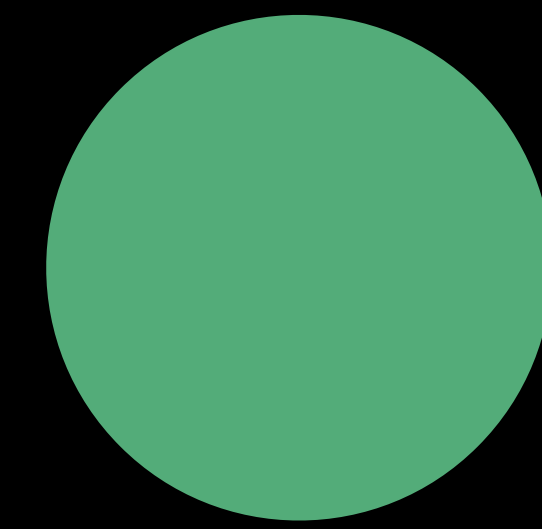
Interactions, Visuals, Audio and Haptics





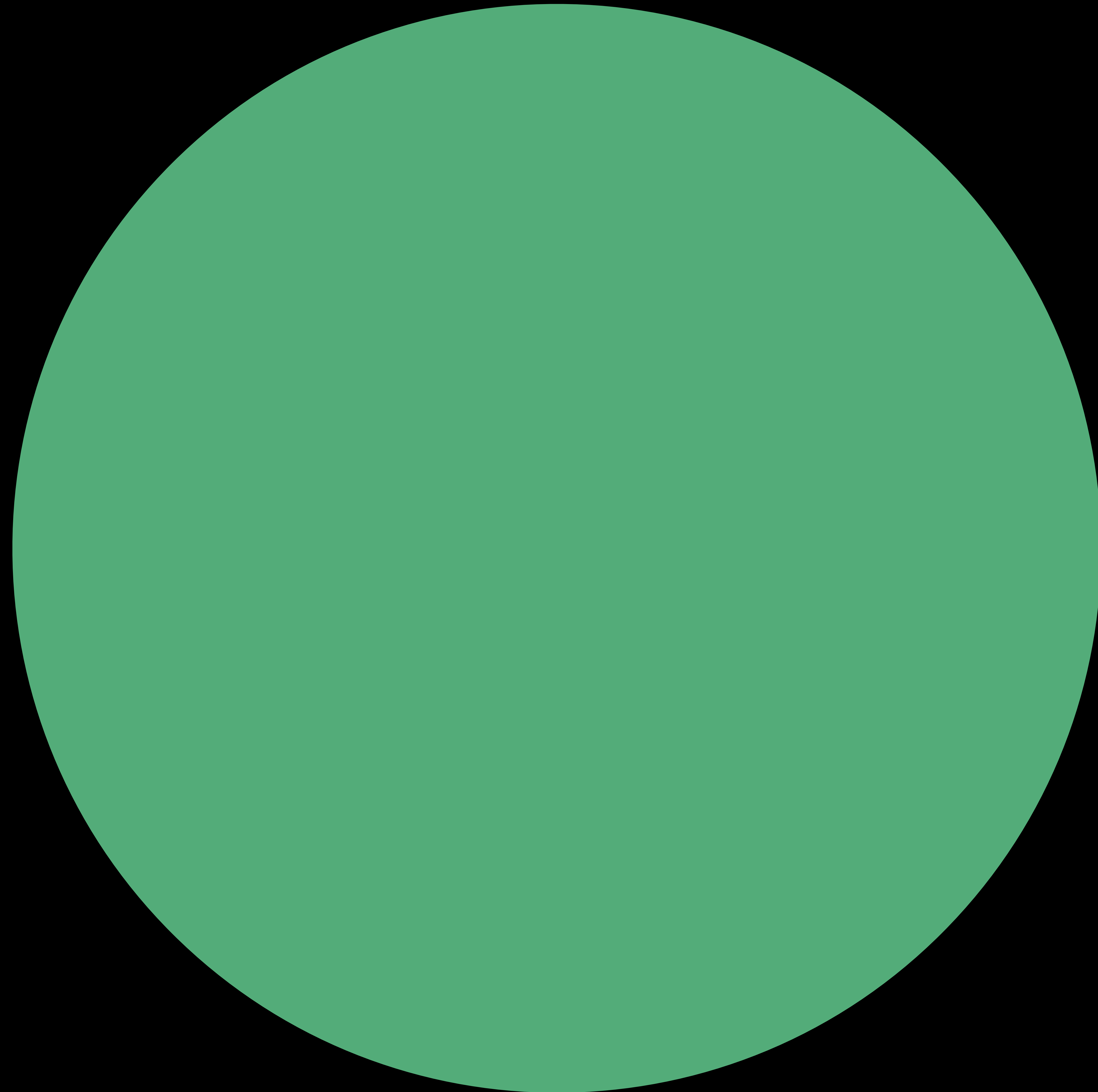
# Harmony

Interactions, Visuals, Audio and Haptics



# Harmony

Interactions, Visuals, Audio and Haptics



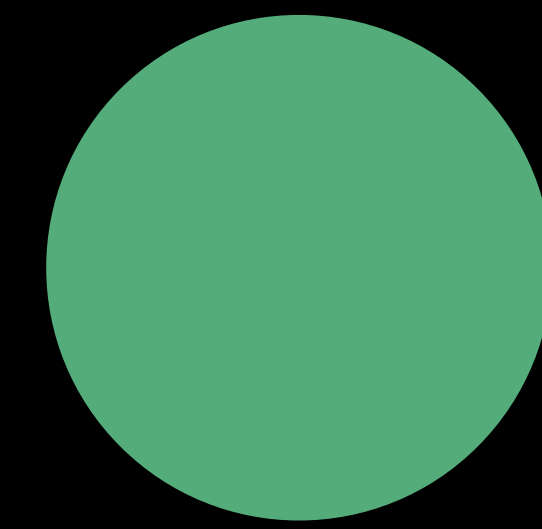
# Harmony

Interactions, Visuals, Audio and Haptics



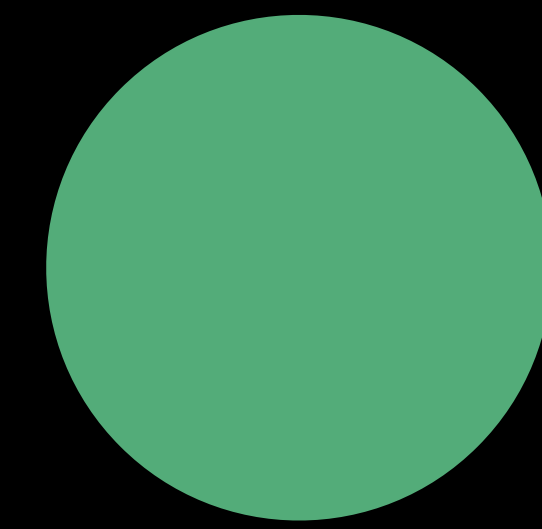
# Harmony

Interactions, Visuals, Audio and Haptics



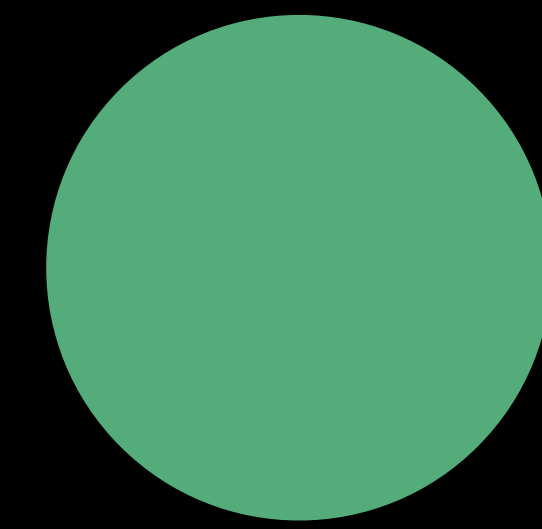
# Harmony

Interactions, Visuals, Audio and Haptics



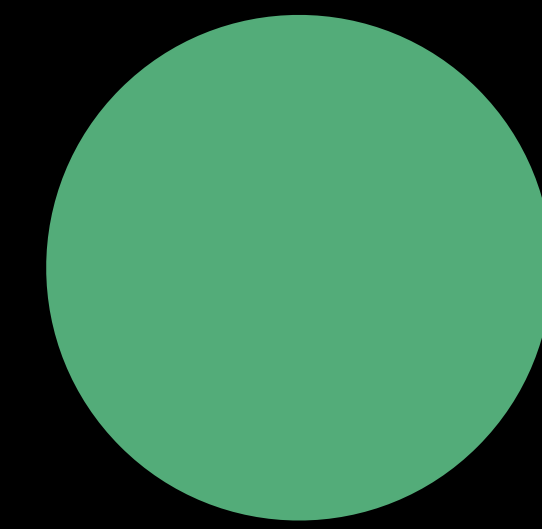
# Harmony

Interactions, Visuals, Audio and Haptics



# Harmony

Interactions, Visuals, Audio and Haptics



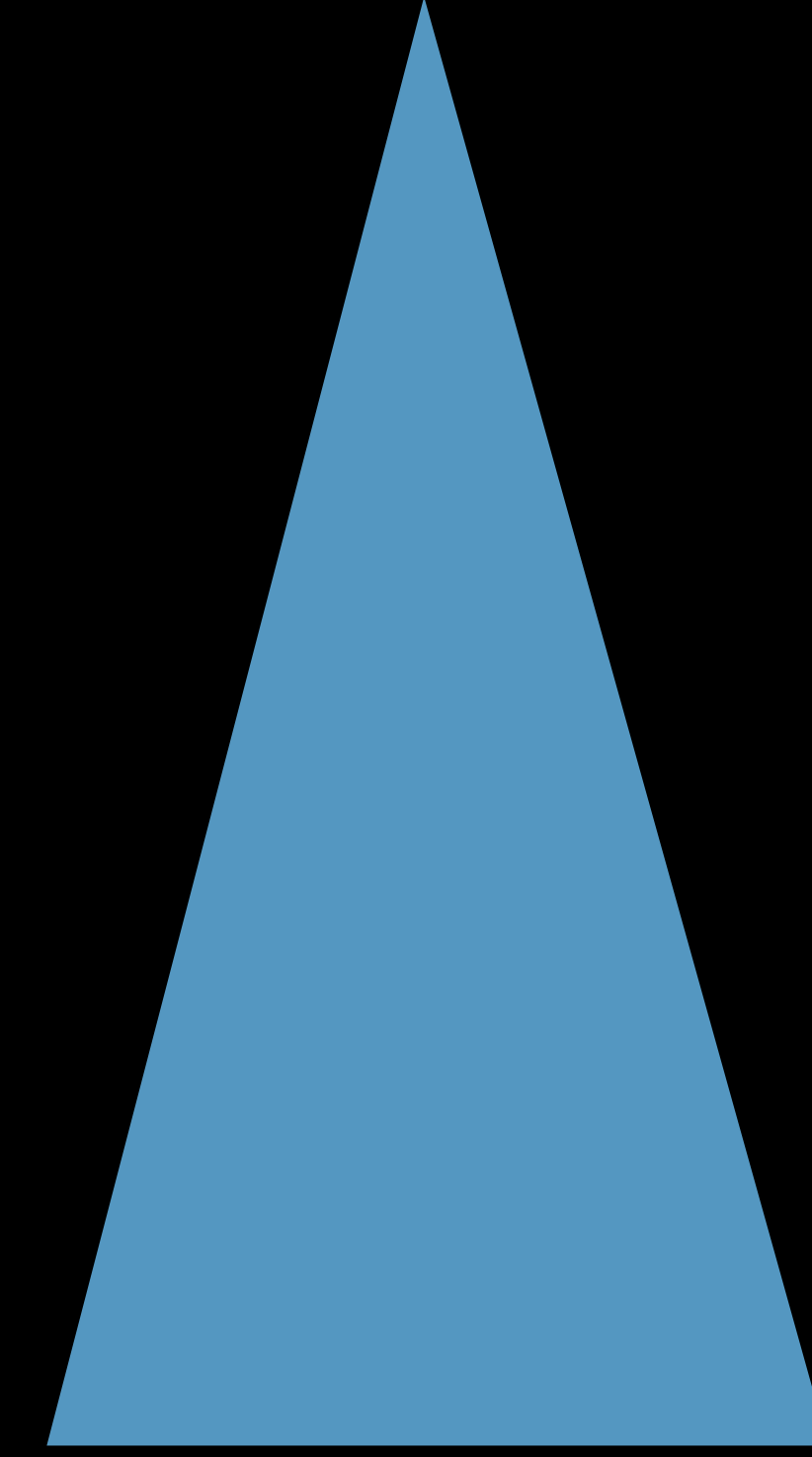
# Harmony

Interactions, Visuals, Audio and Haptics

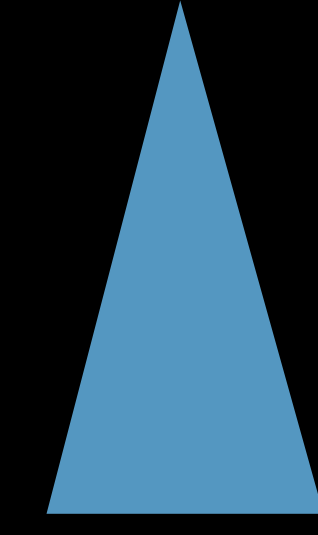




# Digital Crown Haptic



# Digital Crown Haptic






















 Activity


 Alarms


 Breathe


 28  
Calendar



 Activity

 Alarms


 Breathe


 28  
Calendar



 Activity


 Alarms


 Breathe


 28  
Calendar



 Activity

 Alarms

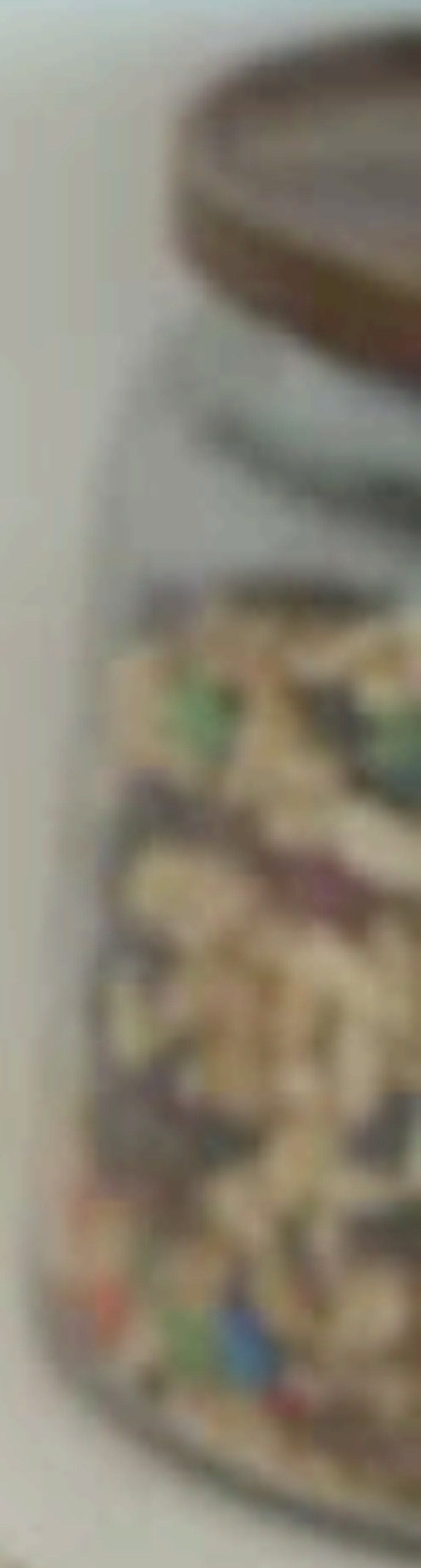
 Breathe

 28  
Calendar

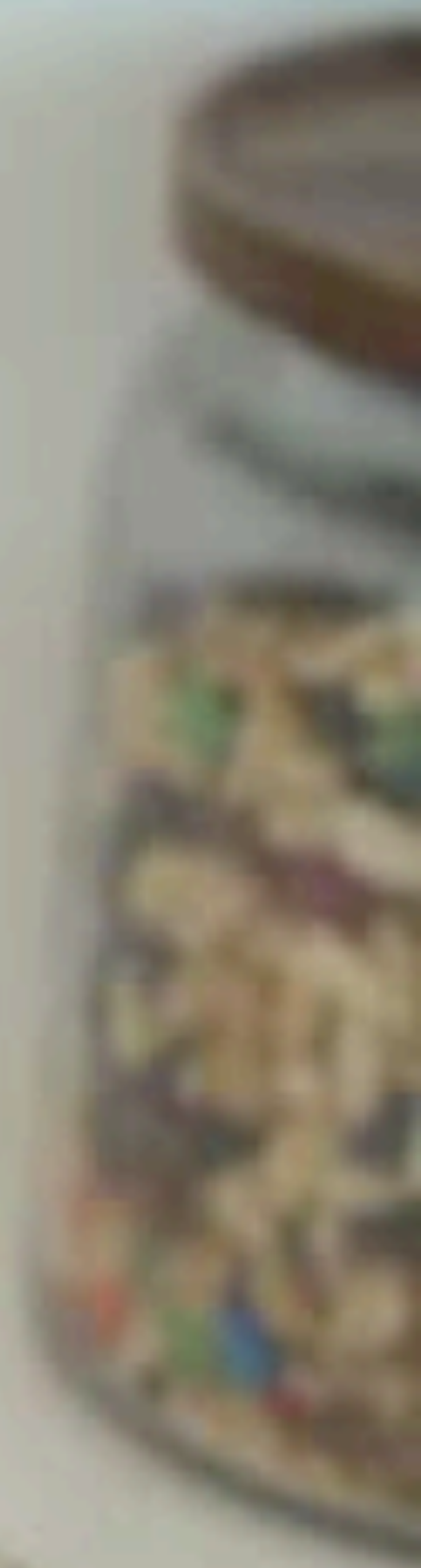
**Utility**

# Utility

“Add audio and haptics that provide clear value to your app experience”







**Utility**

Moderation

**Utility**

Moderation

Focus

# Utility

Moderation

Focus

Keep it simple

# Guiding Principles

# Guiding Principles

Causality

# Guiding Principles

Causality

Harmony

# Guiding Principles

Causality

Harmony

Utility



What is an Audio Haptic experience?

Three guiding principles

Techniques

# Core Haptics Primitives

# Core Haptics Primitives



Transient

# Core Haptics Primitives



Transient



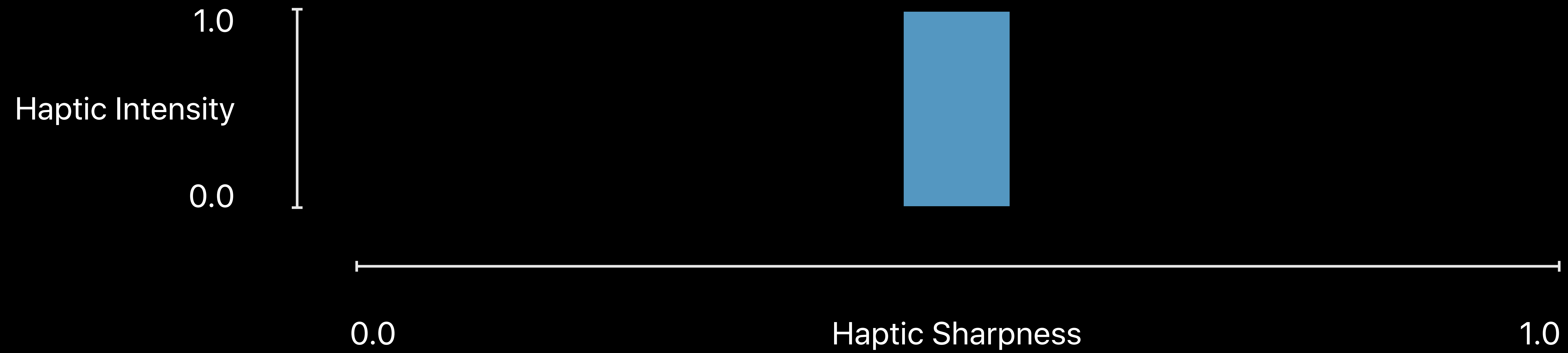
Continuous

# Core Haptics Transient

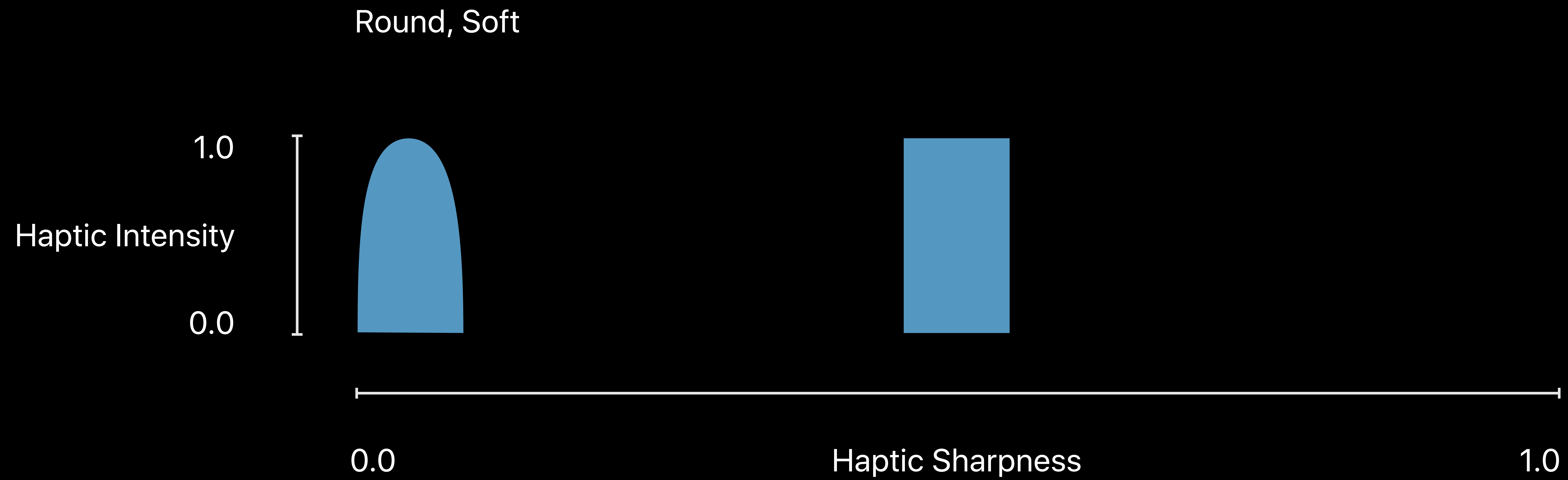
# Core Haptics Transient



# Core Haptics Transient

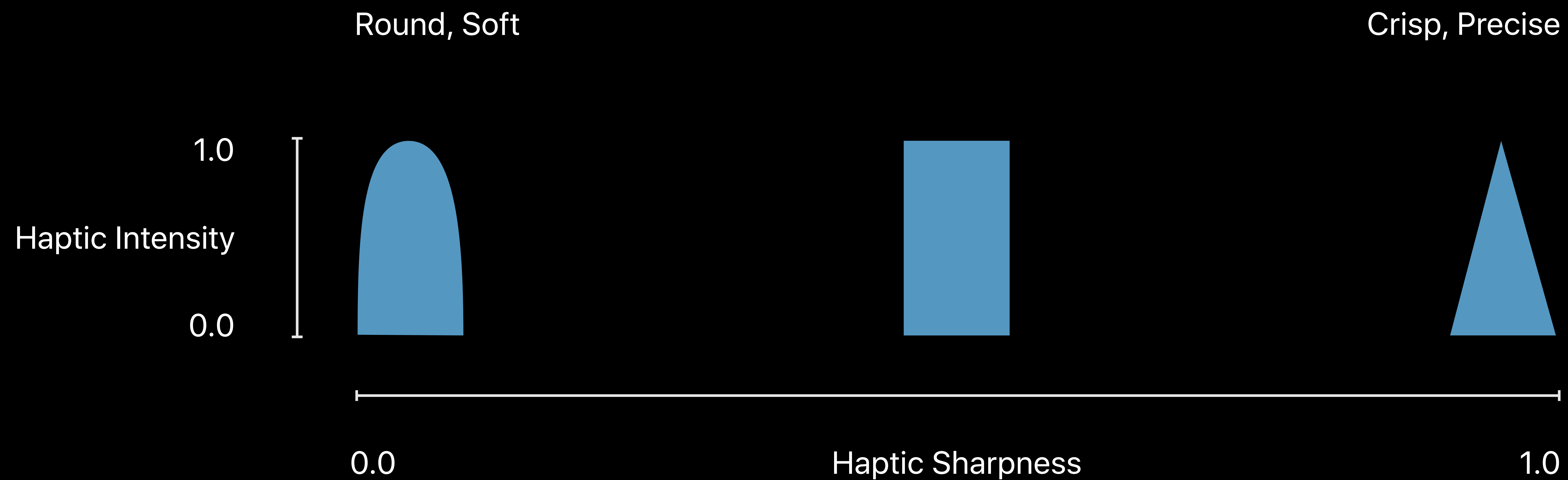


# Core Haptics Transient



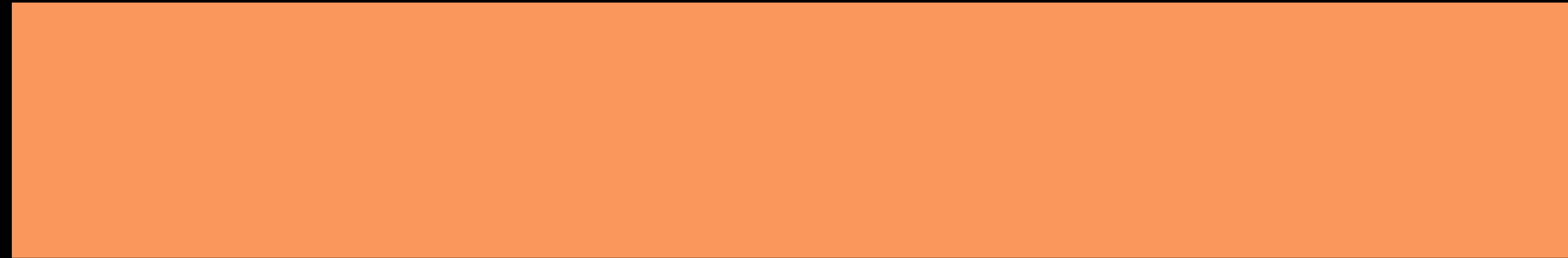


# Core Haptics Transient

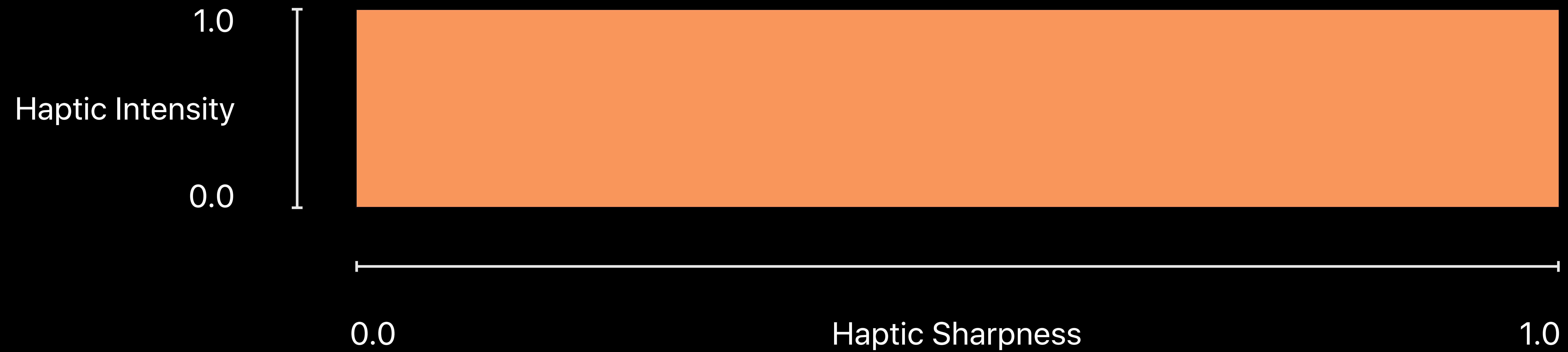


# Core Haptics Continuous

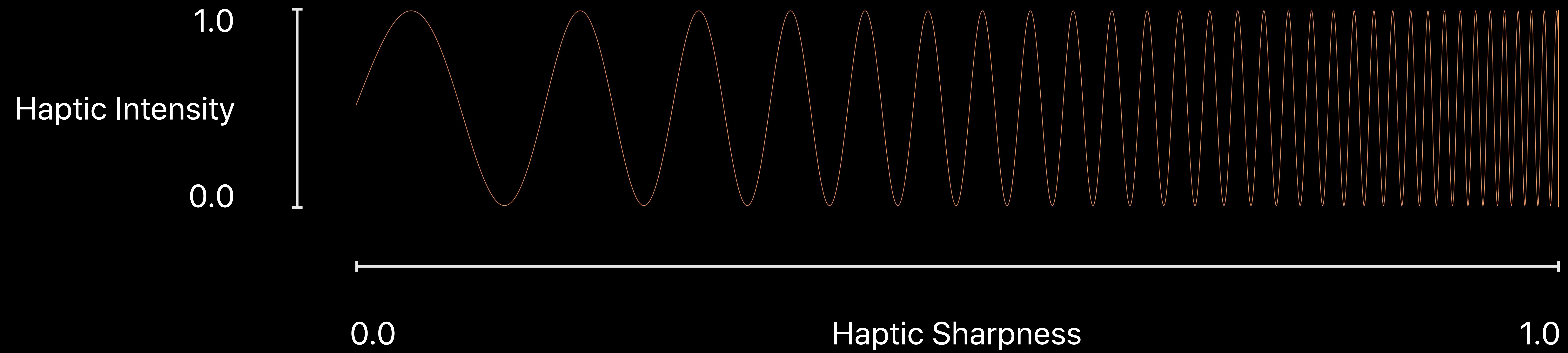
# Core Haptics Continuous



# Core Haptics Continuous

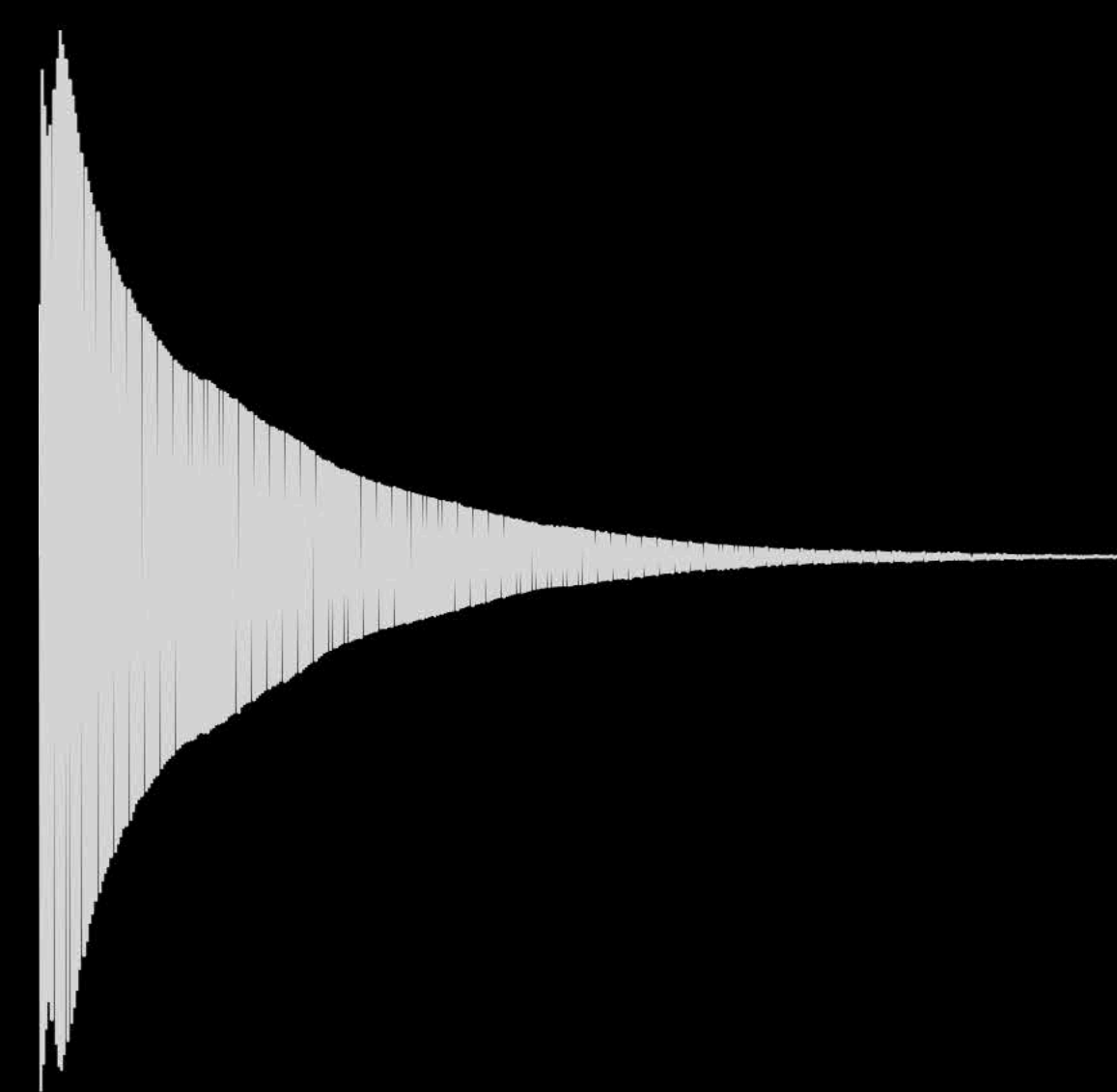


# Core Haptics Continuous



# Sound Building Blocks

# Sound Building Blocks

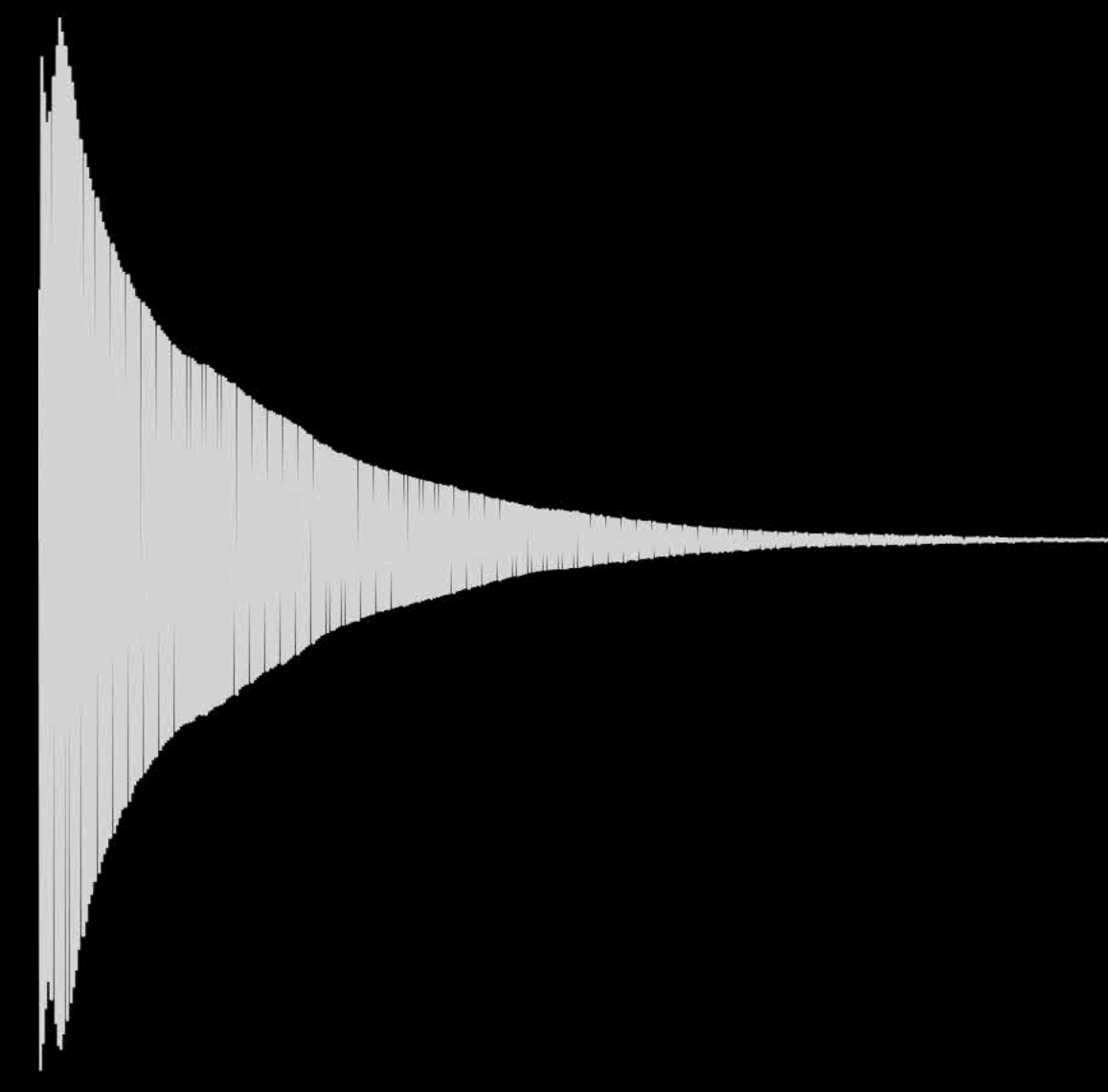


# Sound Building Blocks

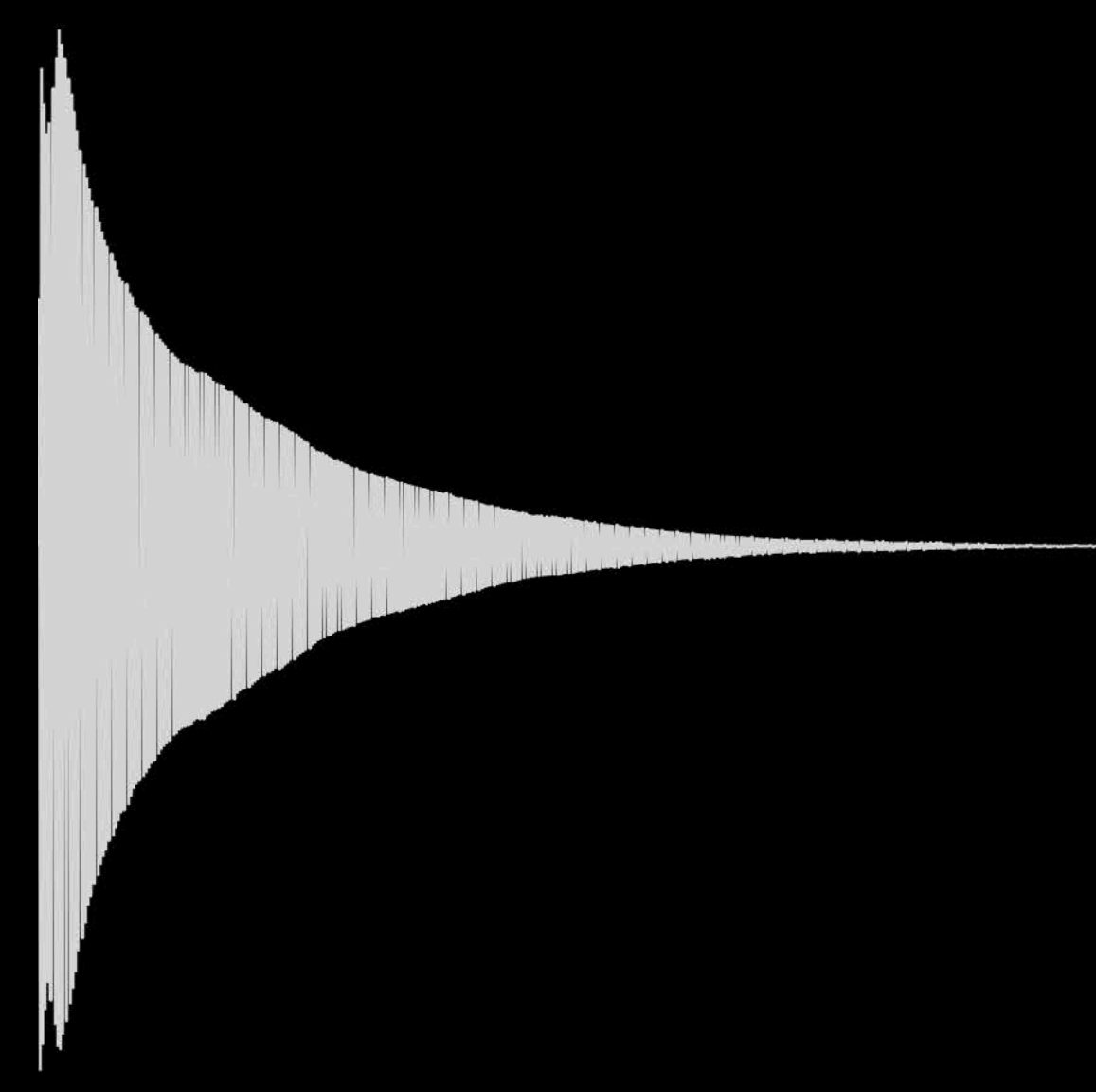




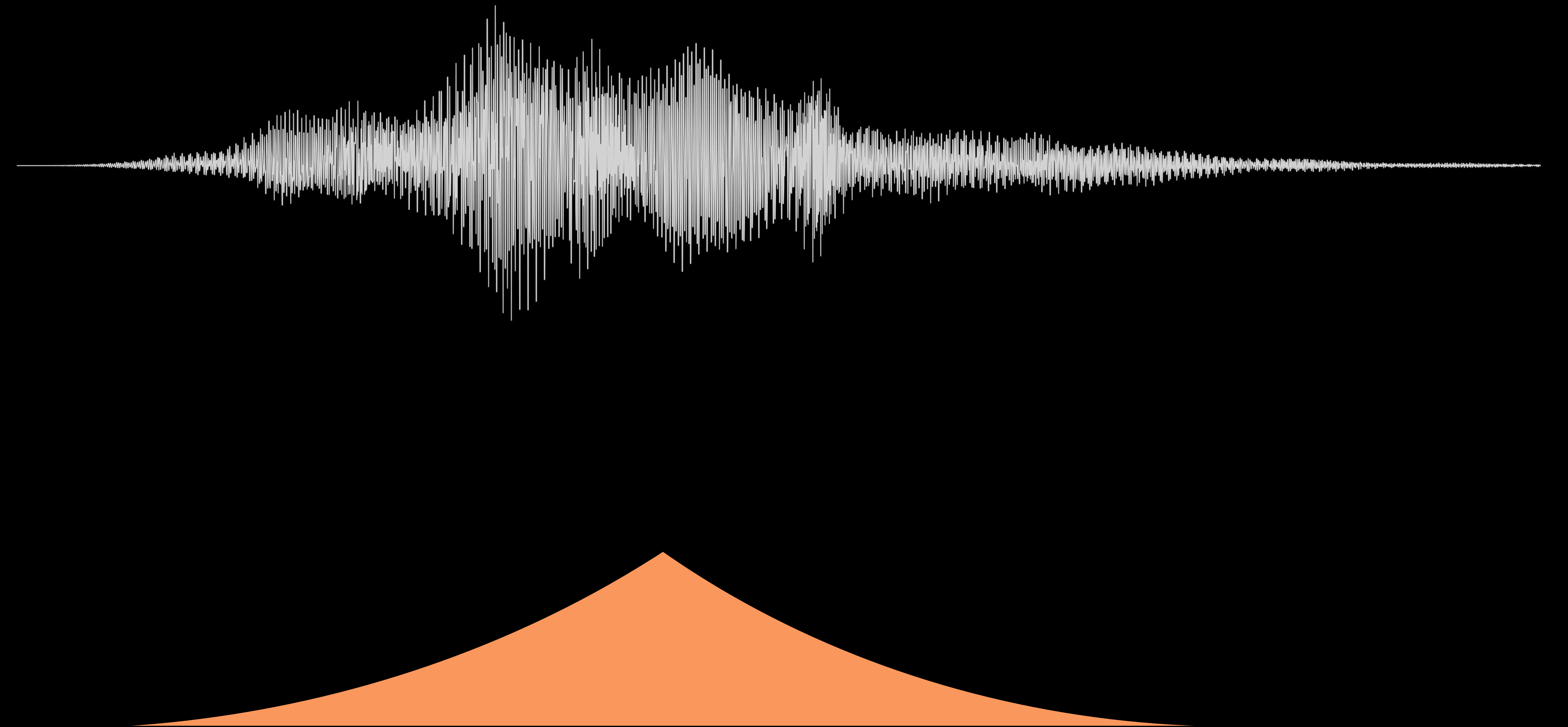
# Sound Building Blocks



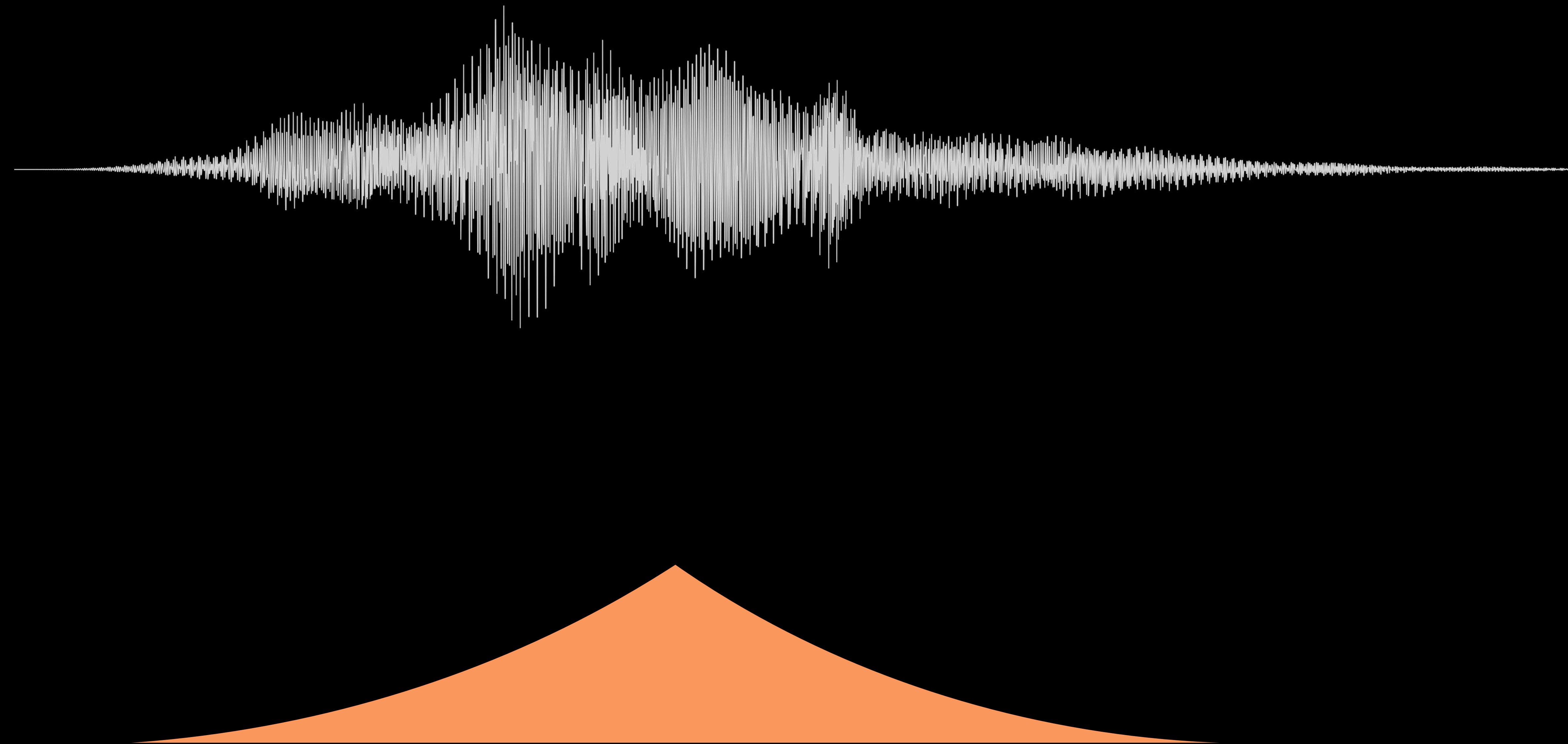
# Sound Building Blocks



# Sound Building Blocks



# Sound Building Blocks



Sound



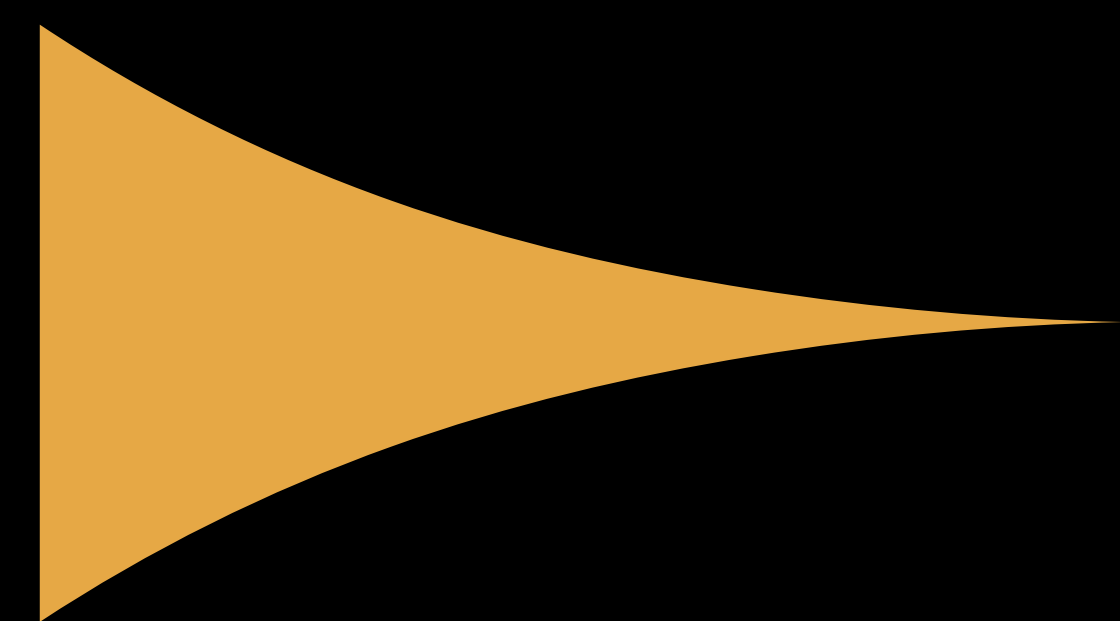
Sound



Sound



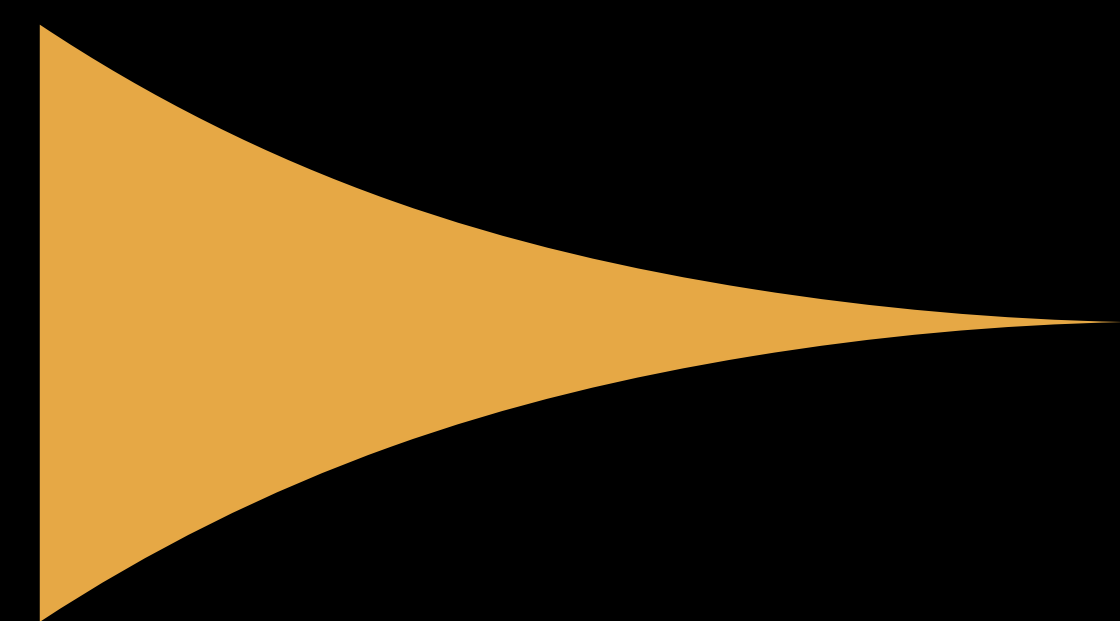
Haptic



Sound



Haptic



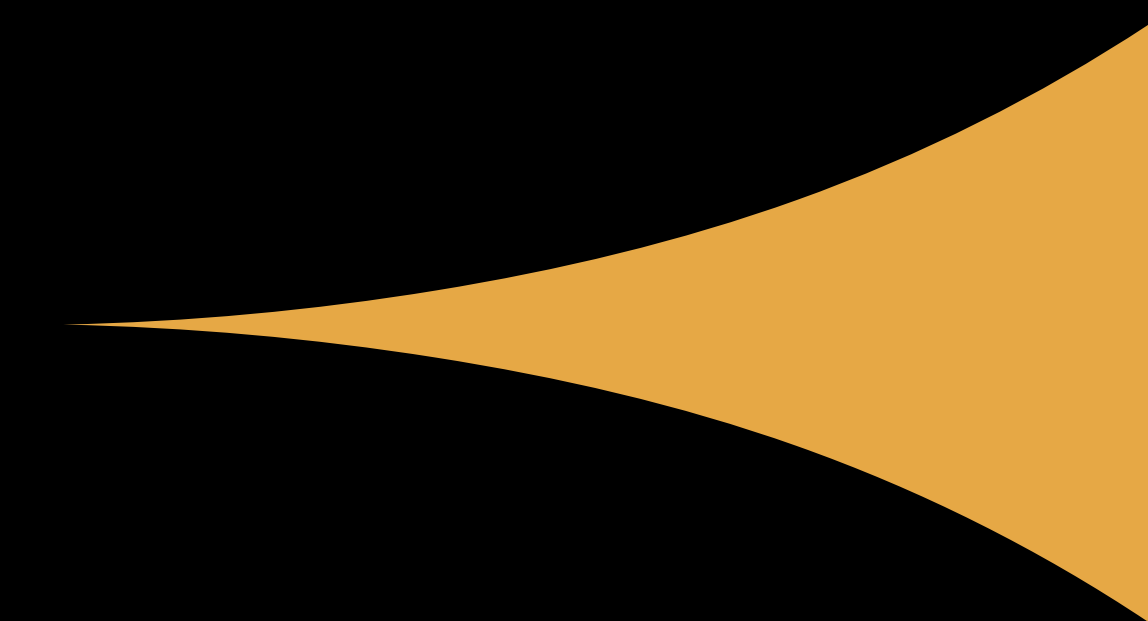


# Anticipation

Sound



Haptic

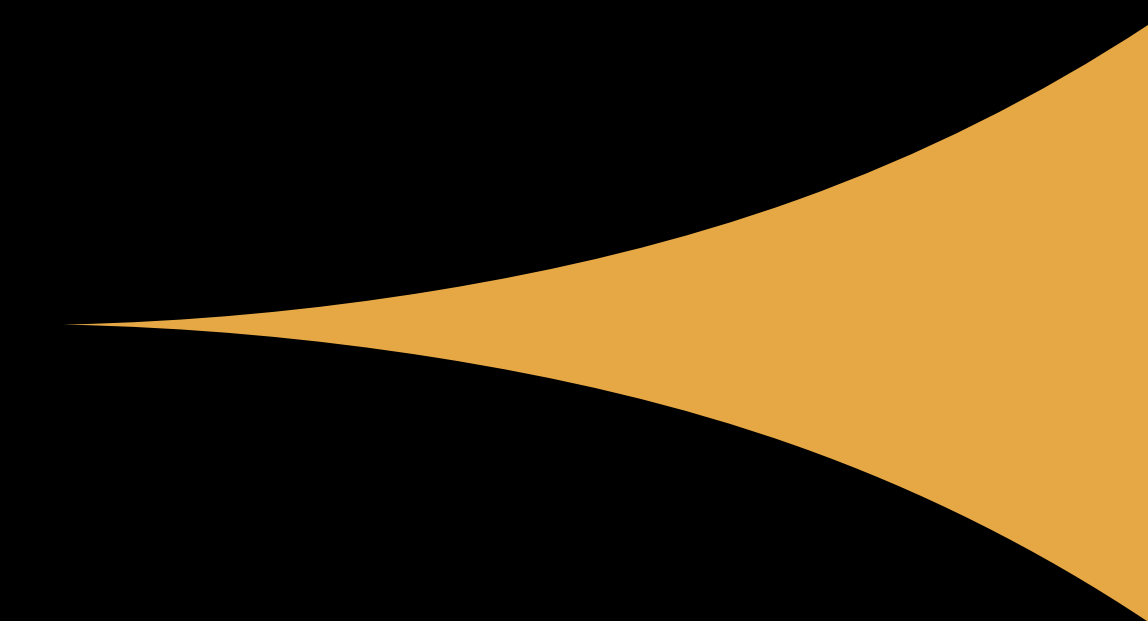


# Anticipation

Sound

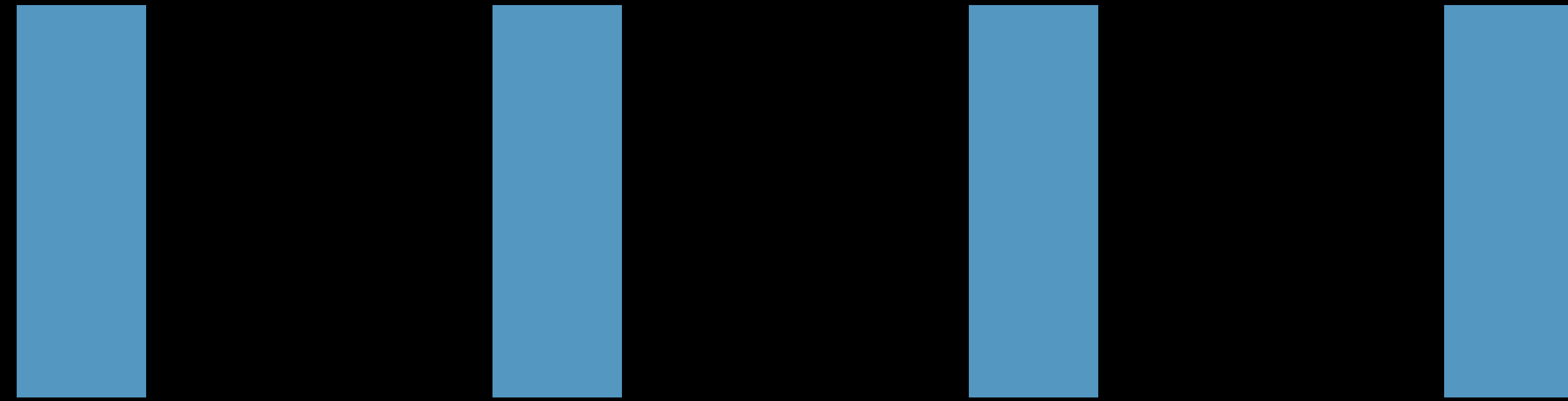


Haptic



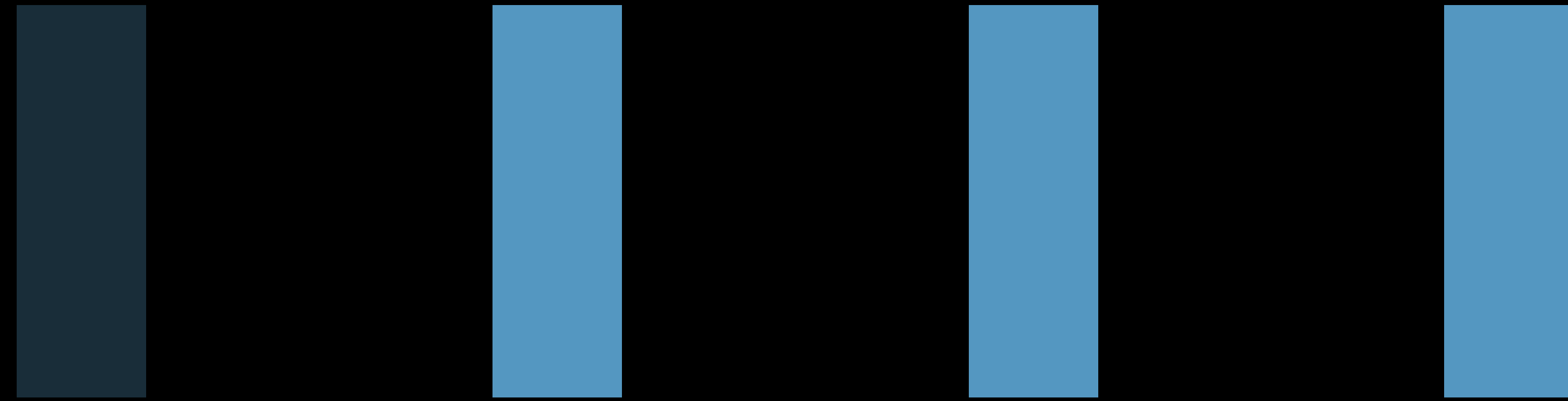
# Number of Events

4 Events



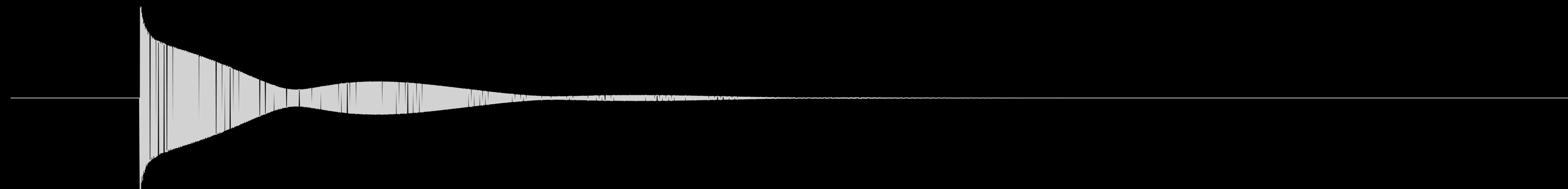
# Number of Events

4 Events

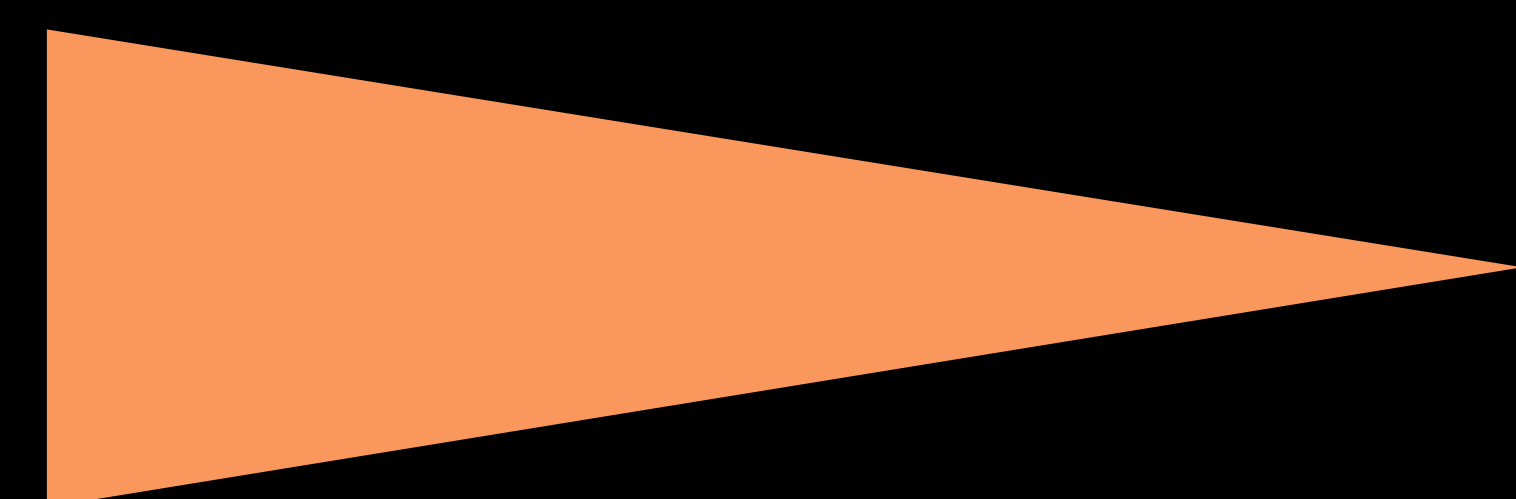


# Haptic Priming

Sound

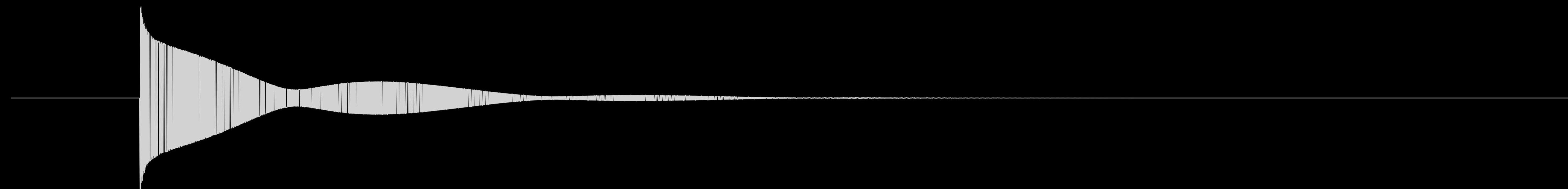


Haptic

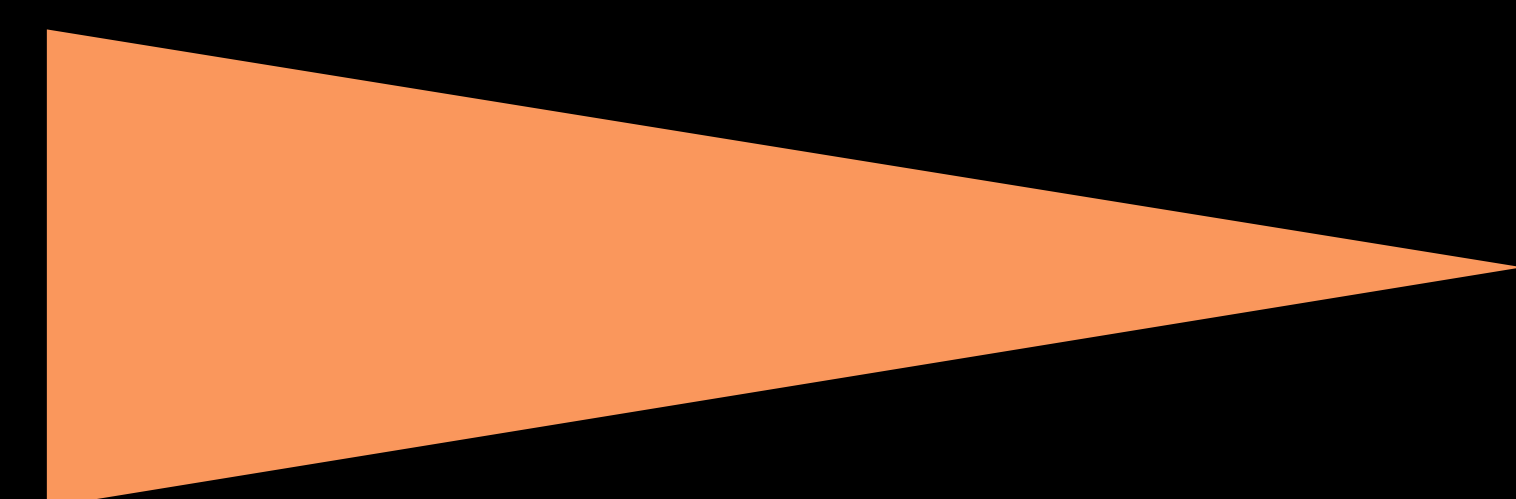


# Haptic Priming

Sound

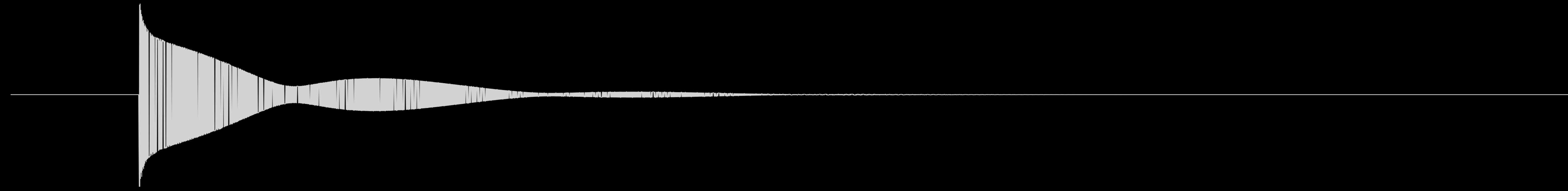


Haptic

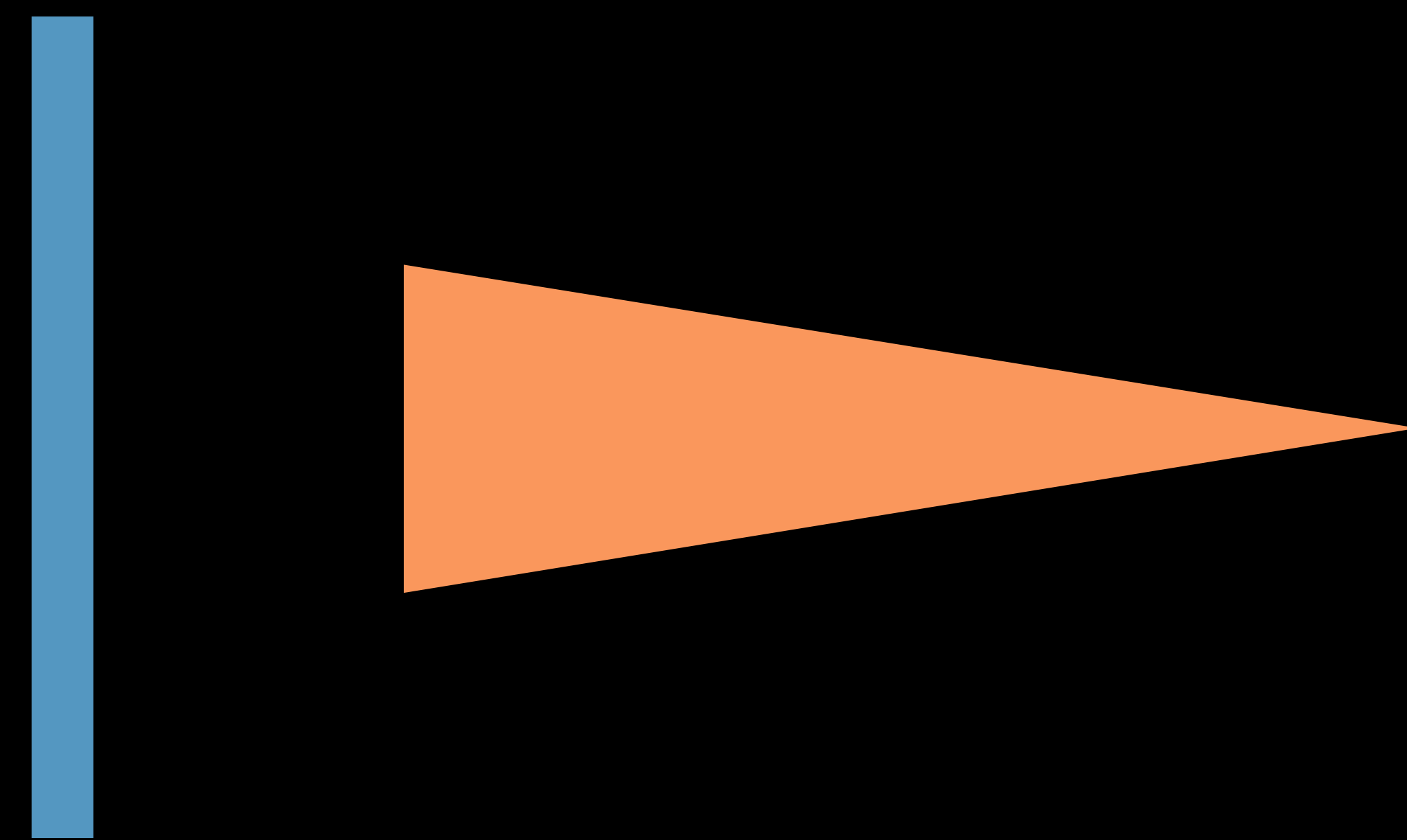


# Haptic Priming

Sound

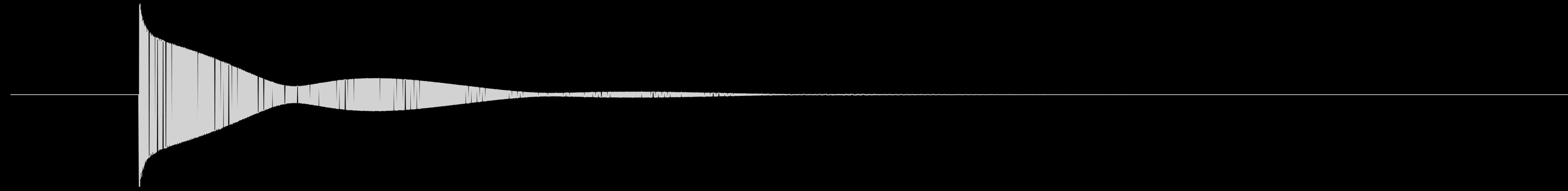


Haptic

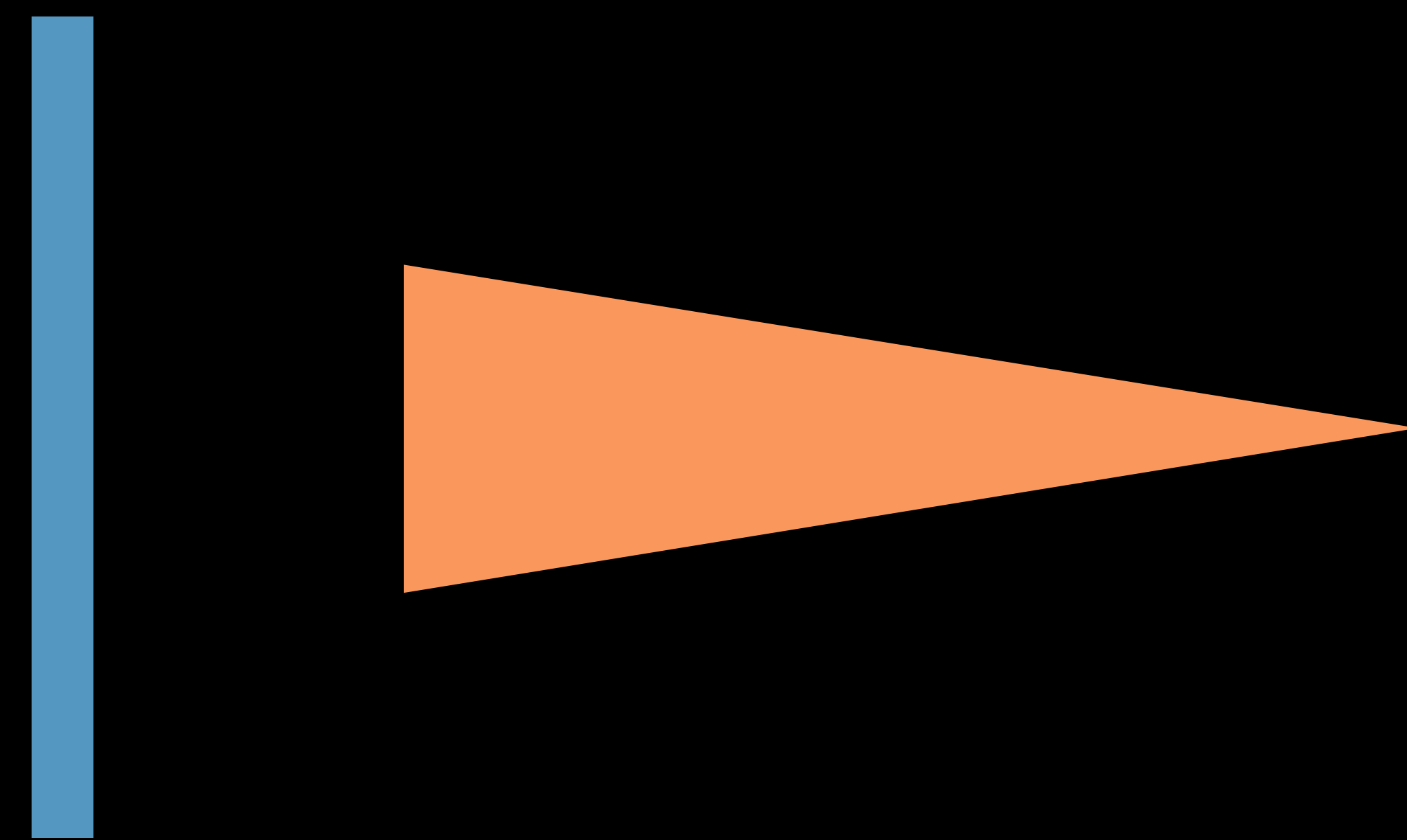


# Haptic Priming

Sound



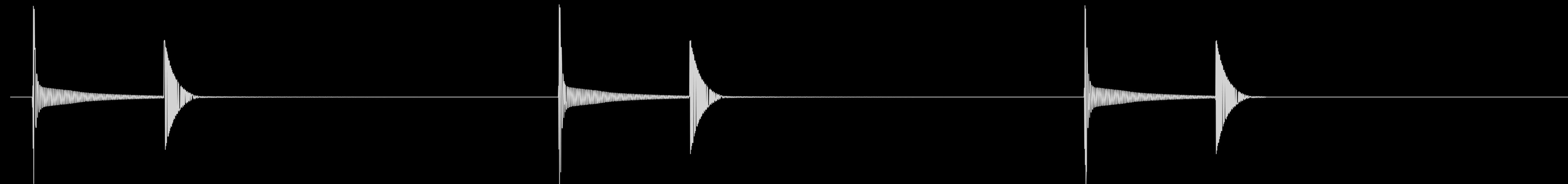
Haptic





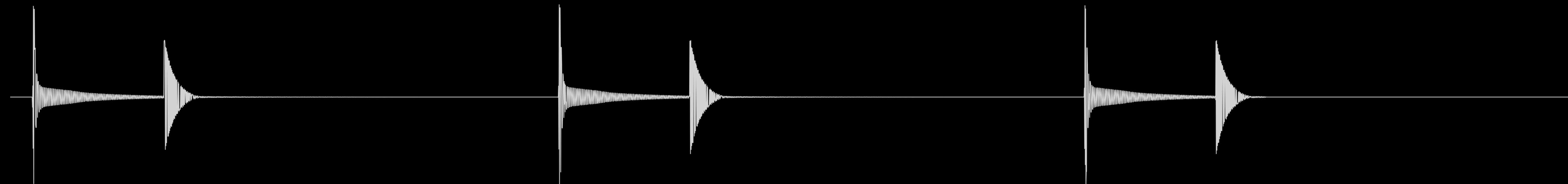
# Contrast—Left

Sound



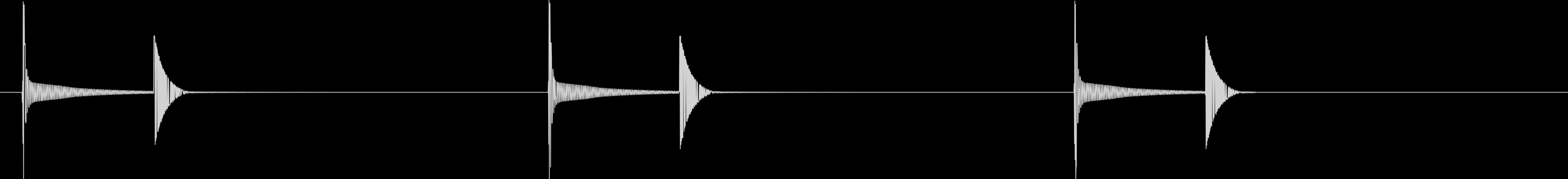
# Contrast—Left

Sound

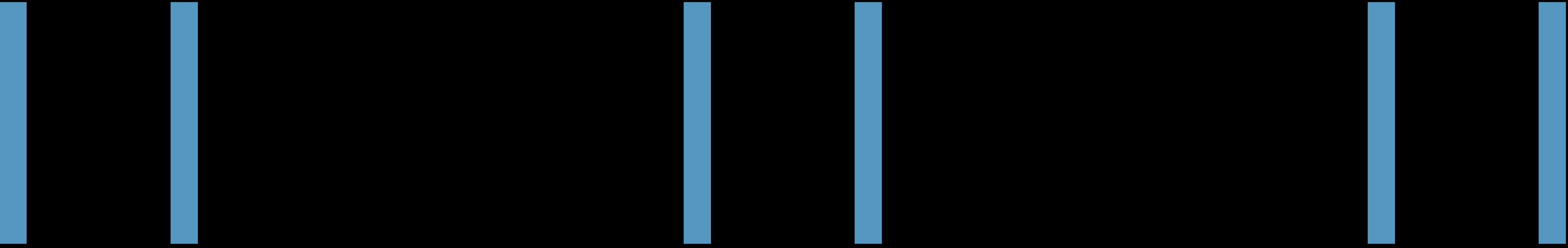


# Contrast—Left

Sound

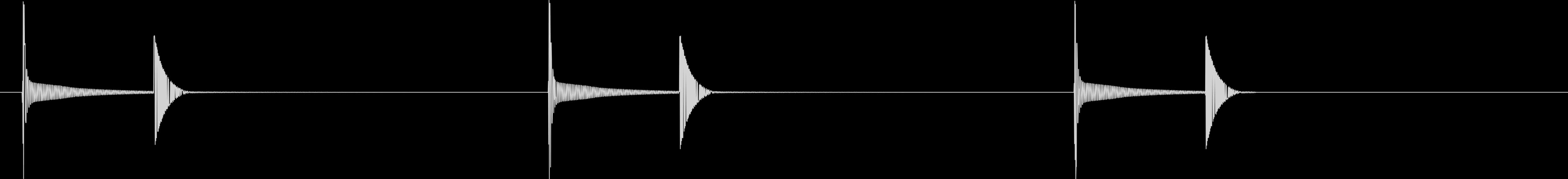


Haptic

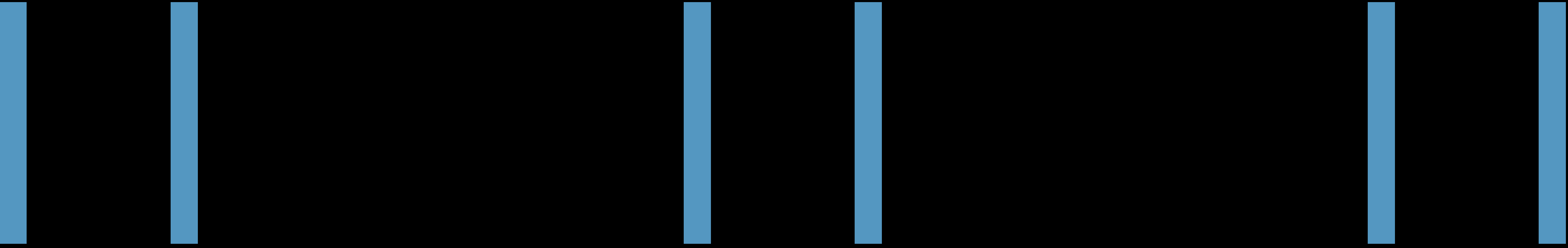


# Contrast—Left

Sound

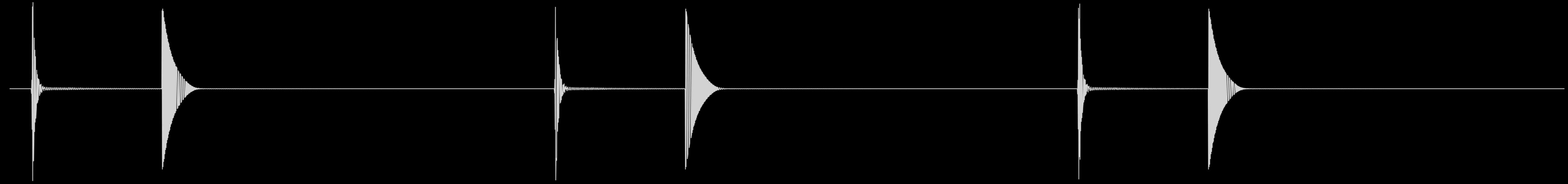


Haptic



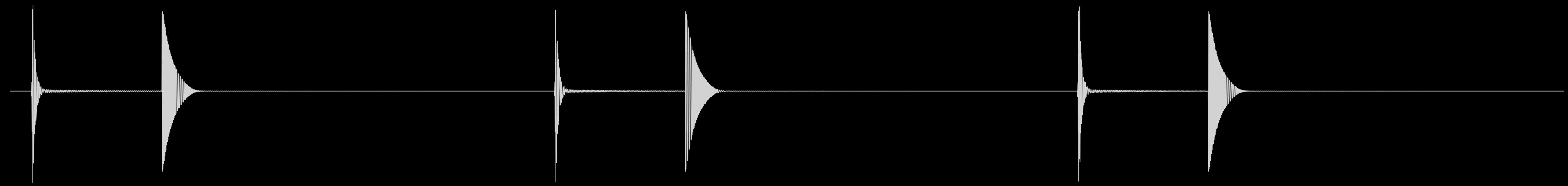
# Contrast—Right

Sound



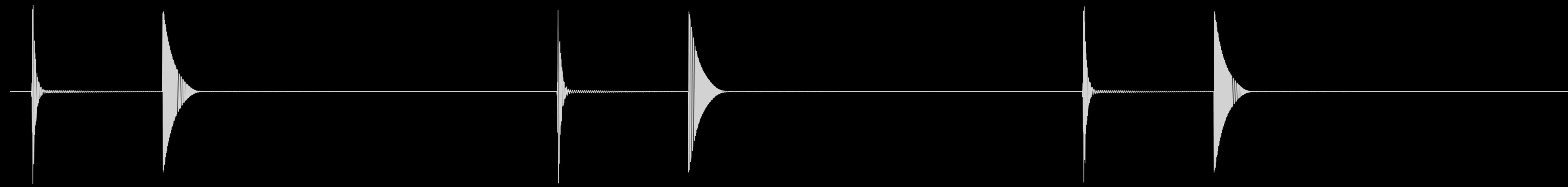
# Contrast—Right

Sound



# Contrast—Right

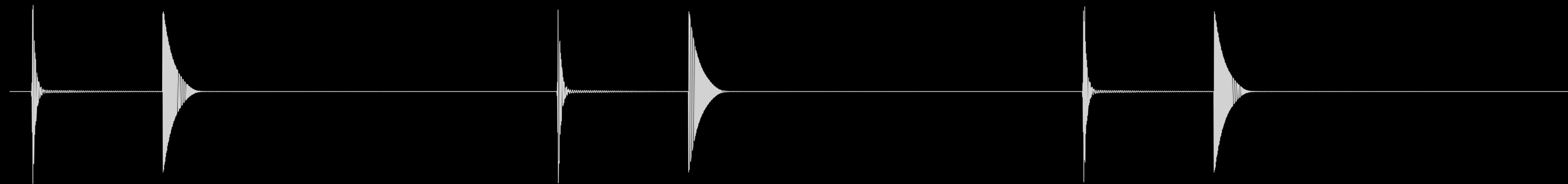
Sound



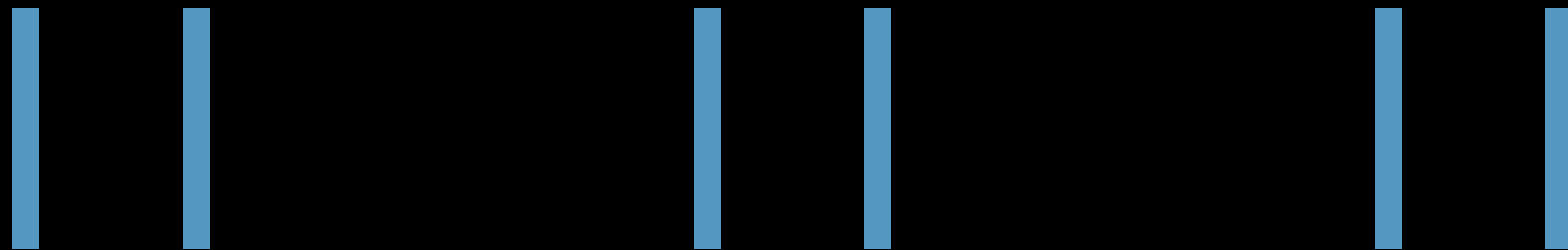
Haptic

# Contrast—Right

Sound



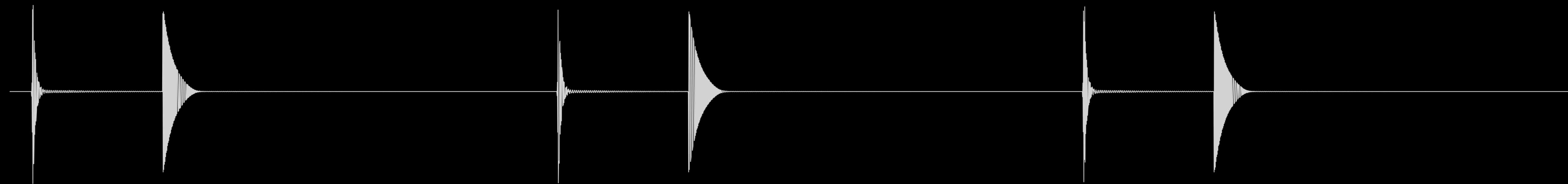
Haptic



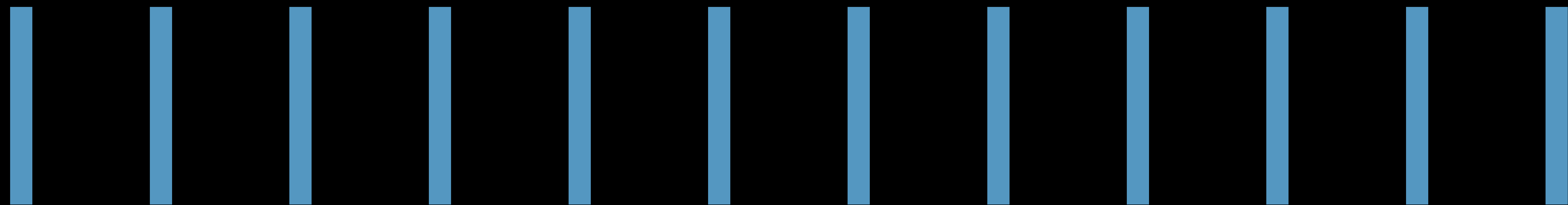


# Contrast—Right

Sound

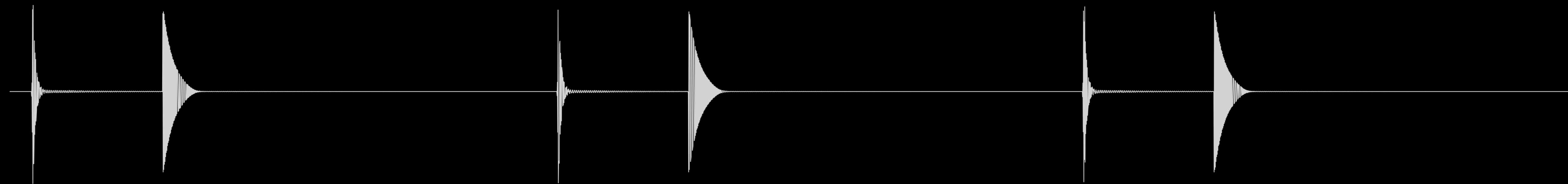


Haptic

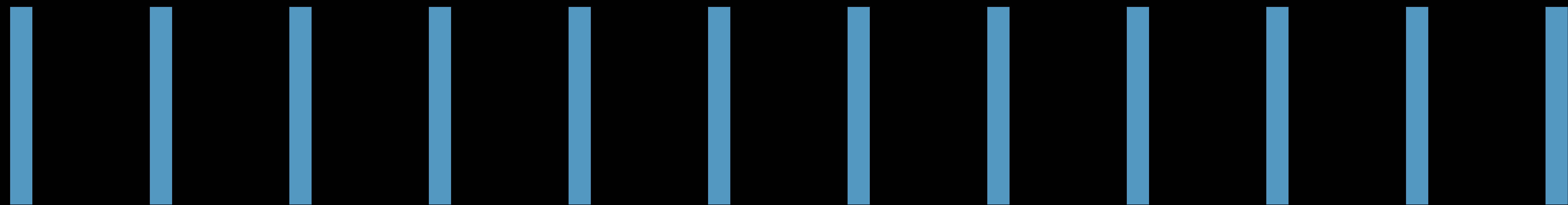


# Contrast—Right

Sound



Haptic



12:00



Camille >

yesterday. Overall it has been very relaxing!!

Hi Hugo, what are you up to tonight?

Today 8:13 PM

Hey Camille, first dinner with family, then fireworks!! 🎆

Fri, May 31, 5:37 PM

Sounds nice! Where are you watching?

Today 8:14 PM

Golden Gate Bridge!! You should join us!

Fri, May 31, 5:38 PM

Sounds like fun! See you there!

Today 8:14 PM

See you then

Delivered



iMessage



12:00



Camille >

yesterday. Overall it has been very relaxing!!

Hi Hugo, what are you up to tonight?

Today 8:13 PM

Hey Camille, first dinner with family, then fireworks!! 🎆

Fri, May 31, 5:37 PM

Sounds nice! Where are you watching?

Today 8:14 PM

Golden Gate Bridge!! You should join us!

Fri, May 31, 5:38 PM

Sounds like fun! See you there!

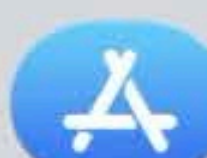
Today 8:14 PM

See you then

Delivered



iMessage



12:00



Camille >

yesterday. Overall it has been very relaxing!!

Hi Hugo, what are you up to tonight?

Today 8:13 PM

Hey Camille, first dinner with family, then fireworks!! 🎆

Fri, May 31, 5:37 PM

Sounds nice! Where are you watching?

Today 8:14 PM

Golden Gate Bridge!! You should join us!

Fri, May 31, 5:38 PM

Sounds like fun! See you there!

Today 8:14 PM

See you then

Delivered



iMessage



12:00



Camille >

yesterday. Overall it has been very relaxing!!

Hi Hugo, what are you up to tonight?

Today 8:13 PM

Hey Camille, first dinner with family, then fireworks!! 🎆

Fri, May 31, 5:37 PM

Sounds nice! Where are you watching?

Today 8:14 PM

Golden Gate Bridge!! You should join us!

Fri, May 31, 5:38 PM

Sounds like fun! See you there!

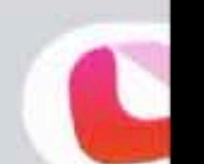
Today 8:14 PM

See you then

Delivered



iMessage



A Few More Thoughts

Collaborate



Experience It

Experiment

# More Information

[developer.apple.com/wwdc19/810](https://developer.apple.com/wwdc19/810)

---

Core Haptics Lab

Thursday, 11:00

---

Core Haptics Lab (2)

Friday, 9:00

---

 WWDC19