Philips Exploratorium

Creative direction
Project management
Interaction Design
Information Architecture

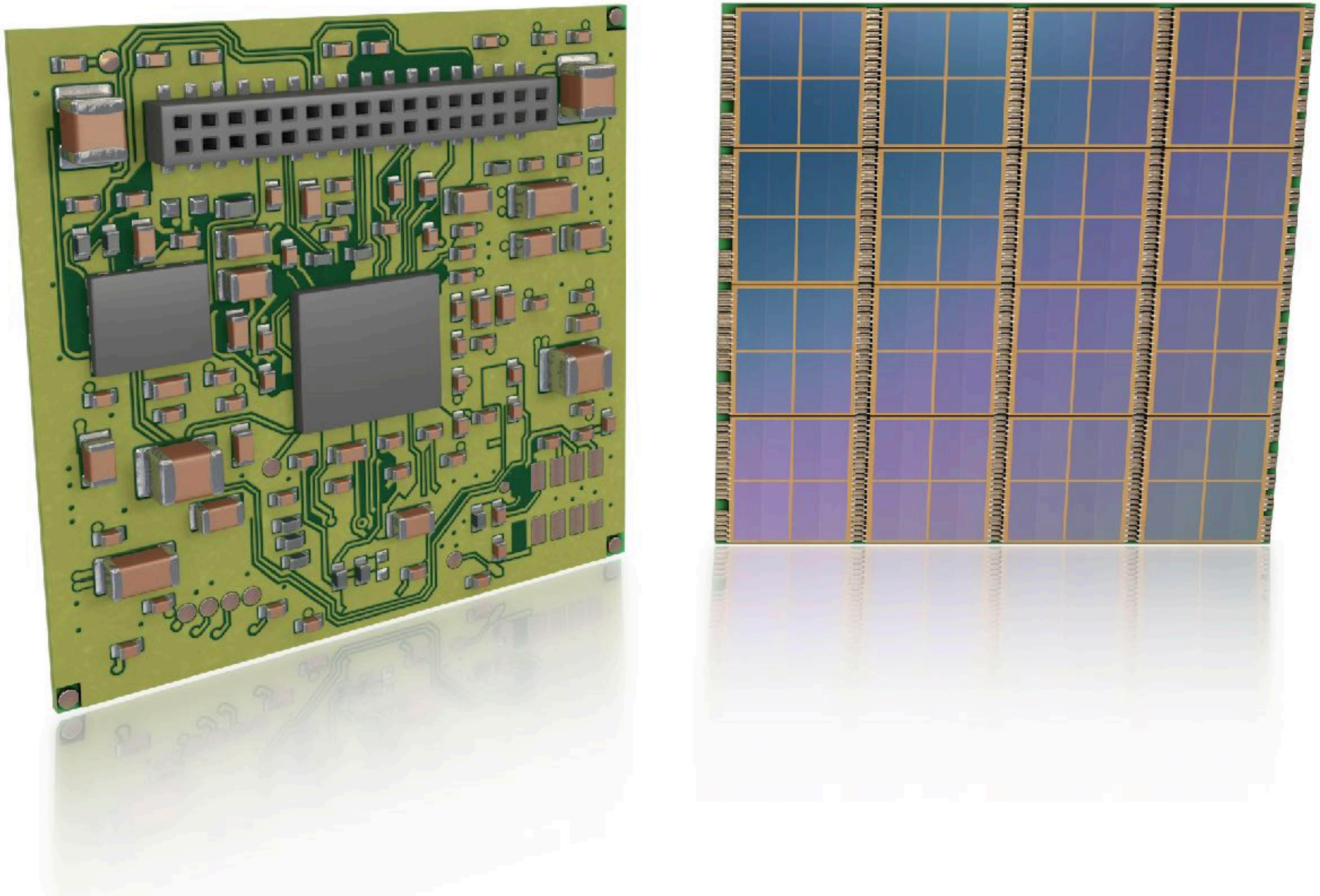
CHALLENGE:

Explaining to a diverse medical trade show audience the technical details of Positron Emission Tomography (PET) imaging - and how Philips' new technology improves upon it.

And beyond that, how to make it flexible, scalable, and engaging.

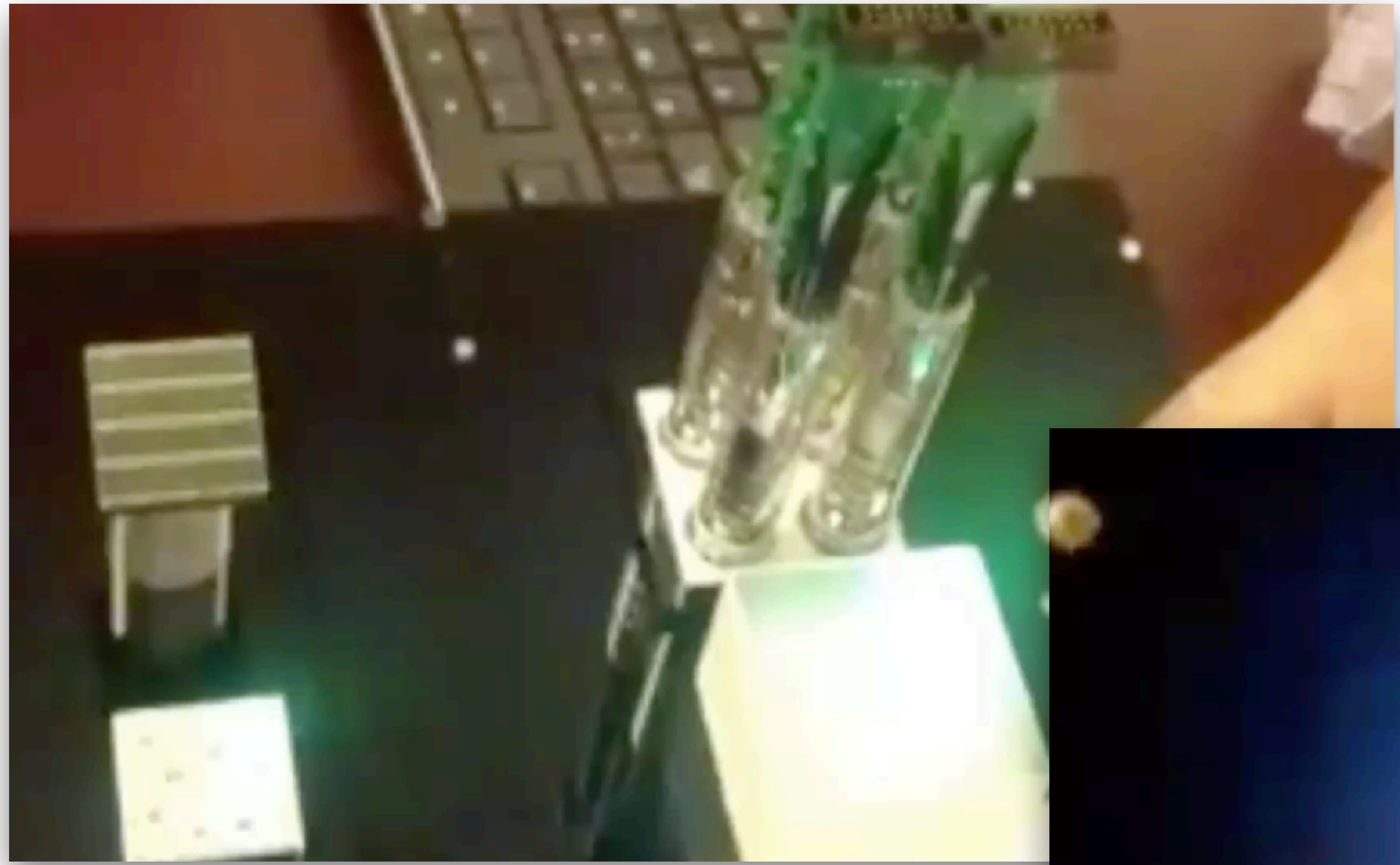
BACKGROUND:

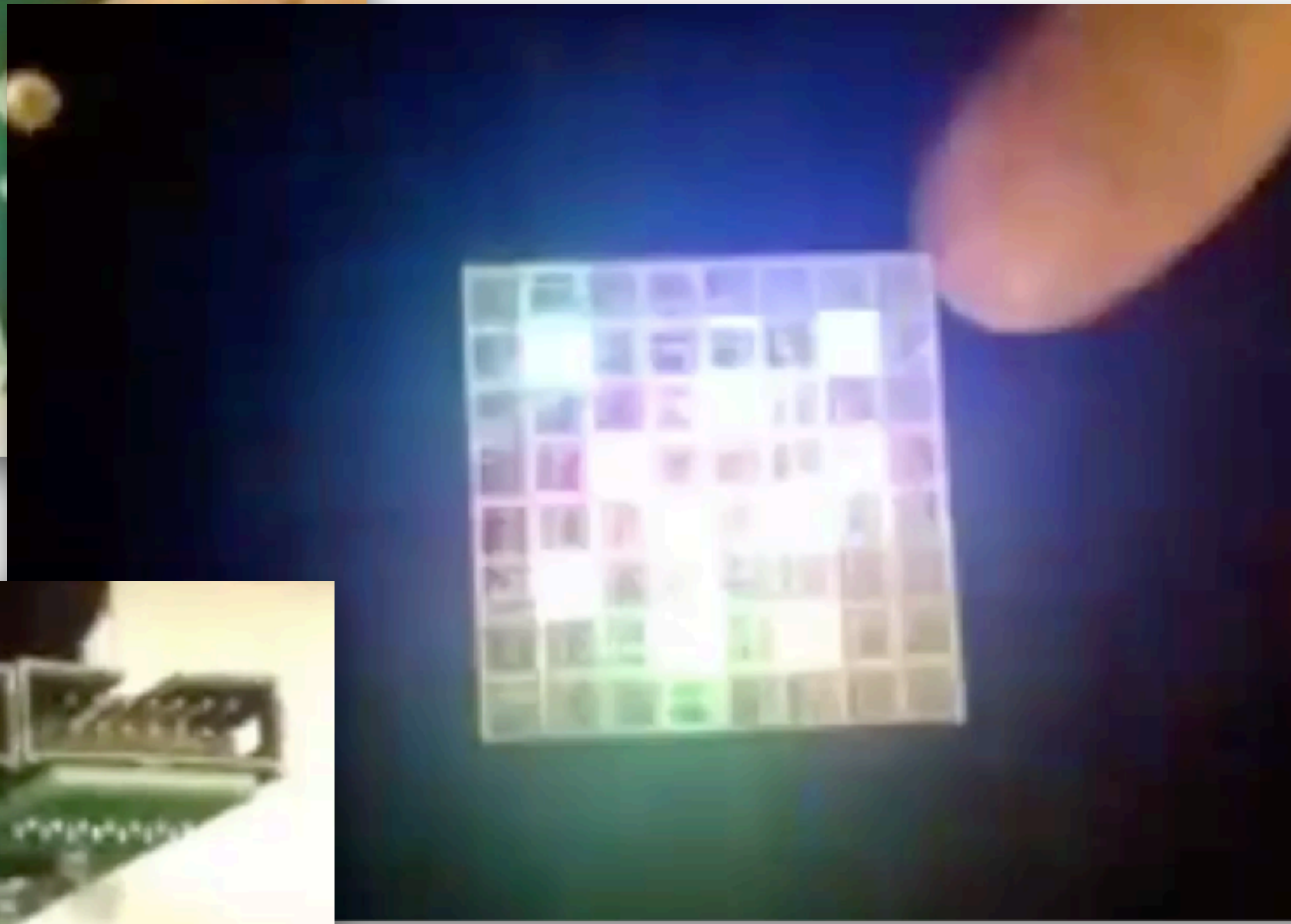
Throughout the multi-year R&D cycle of their groundbreaking Digital Photon Counting (DPC) technology, Phillips Advanced Molecular Imaging (AMI) had been searching for a better way to concisely explain PET imaging and the benefits of DPC.

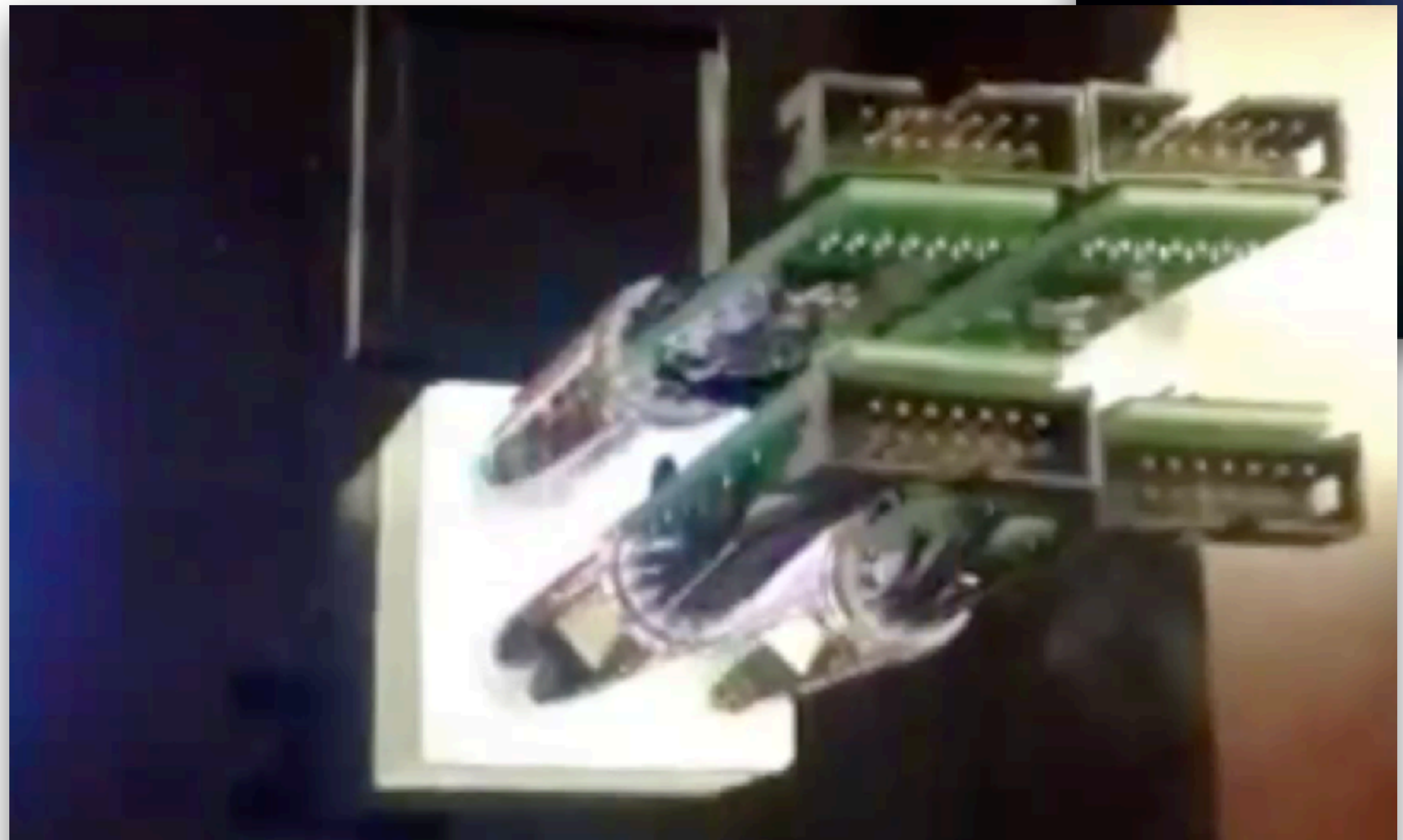


BACKGROUND:

AMI had been using a set of physical models in their demonstrations. However, it was not effective in making the process - or the benefits - clear to their audience.







BACKGROUND:

Complicating matters further, those who had been presenting the models were scientists and specialists whose technical skills were better applied in the laboratory than in sales and demo meetings.

> “The coincidence detection efficiency for 25-mm LSO or BGO crystals is approximately 80% for photons with an energy of 511 keV (15). The absorption efficiency of BGO crystals is greater than that of LSO crystals due to its higher effective atomic number; however, LSO crystals emit five-fold as much light as BGO crystals, and the decay time for LSO is lower at 40 nsec compared with 300 nsec for BGO. See? Piece of cake!”

THE MISSION:

Create a flexible, self-guided, portable, and resilient tool to:

- Explain in straightforward terms how PET scanning works
- Engage the diverse trade show audience at RSNA 2014
- Demonstrate how Philips' new solution improves results

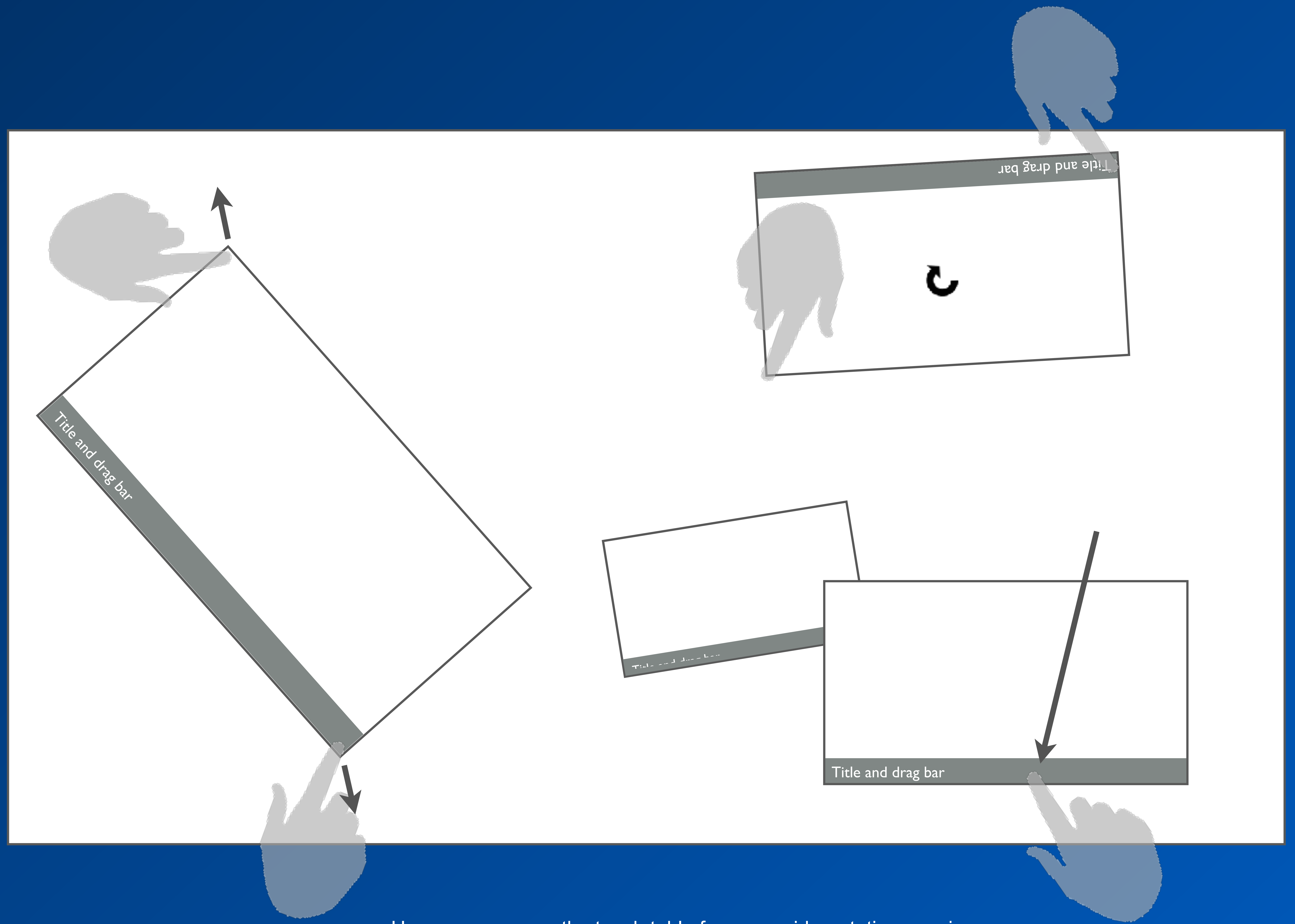
APPROACH:

My team and I designed a multi-user, multi-touch table to attract and engage multiple users simultaneously to our educational "widgets."

My approach in creating the widgets applied mobile design philosophy: Each widget would do one thing and do it well. A slider. A button to press. Something to drag.

The goal: Keep each widget simple, visually striking, and focused on a single primary user action.

Now we just had to understand the subject matter.



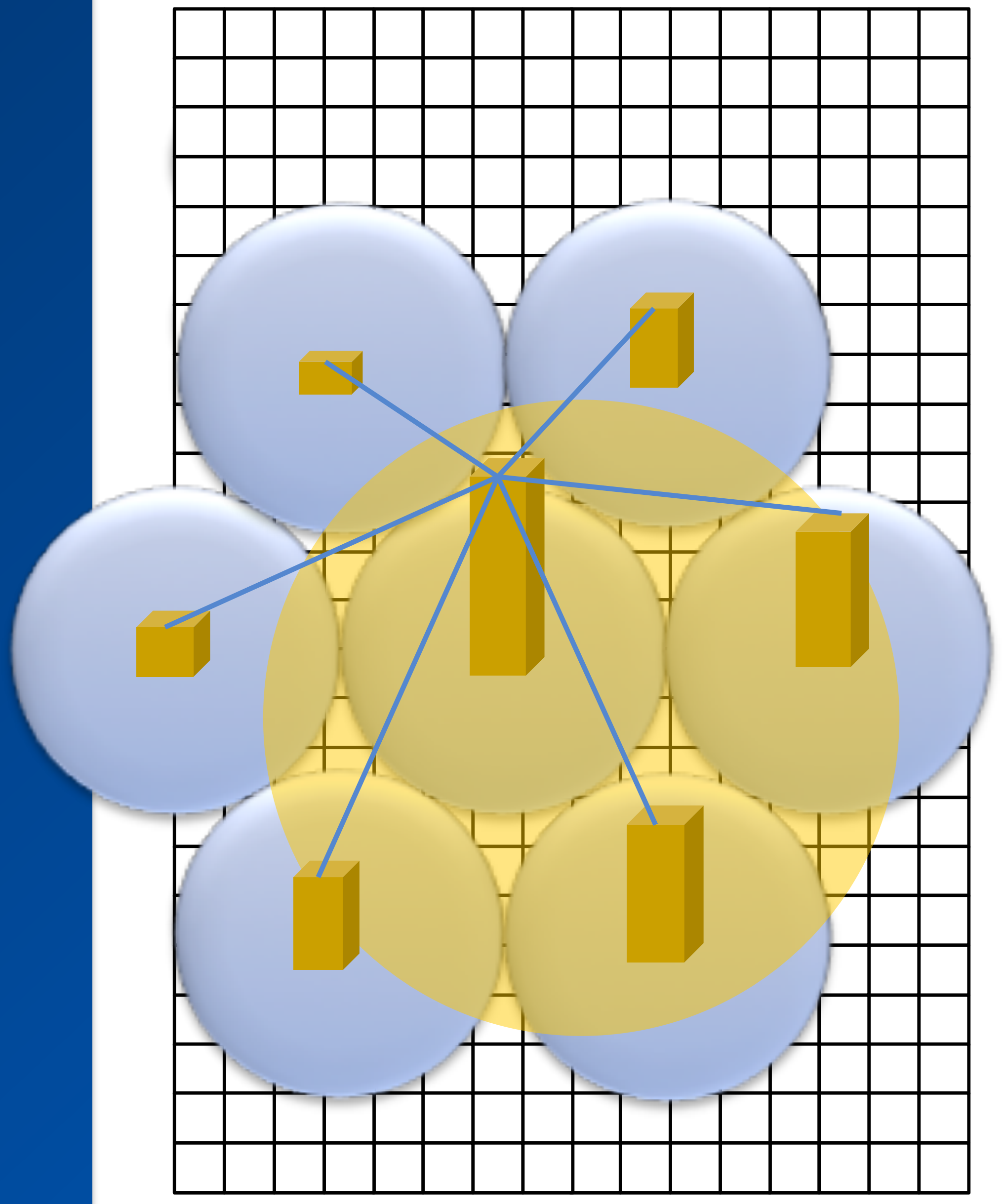
Users may access the touch table from any side, rotating, moving and re-sizing content to suit their needs. There will ideally be no fewer than three and no more than five widgets on the screen at any given time.

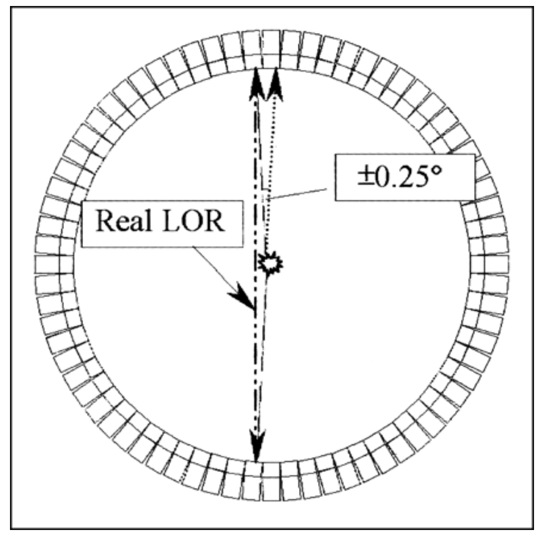
RESEARCH:

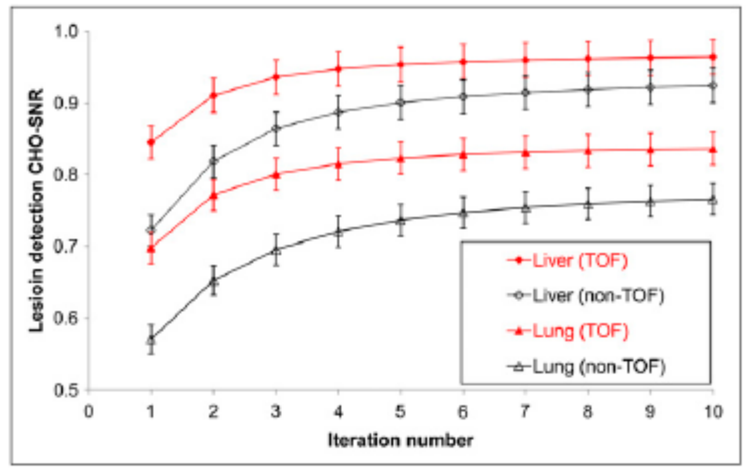
We dug in to Philips materials, Google Scholar, Wikipedia, and the knowledge base of our clients to develop our understanding of the details of PET imaging.

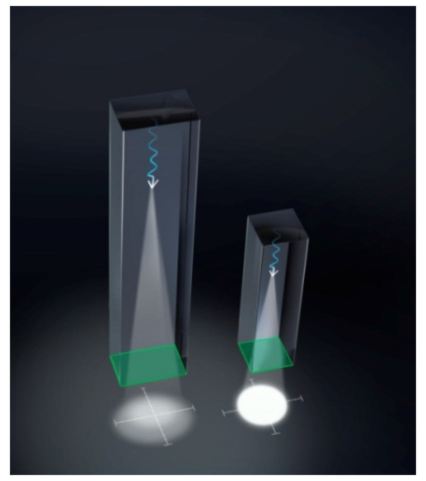
As is so often the case, the key was not only to to understand the topic in detail, but to determine how much to show in order to make it clear… without overwhelming the user.

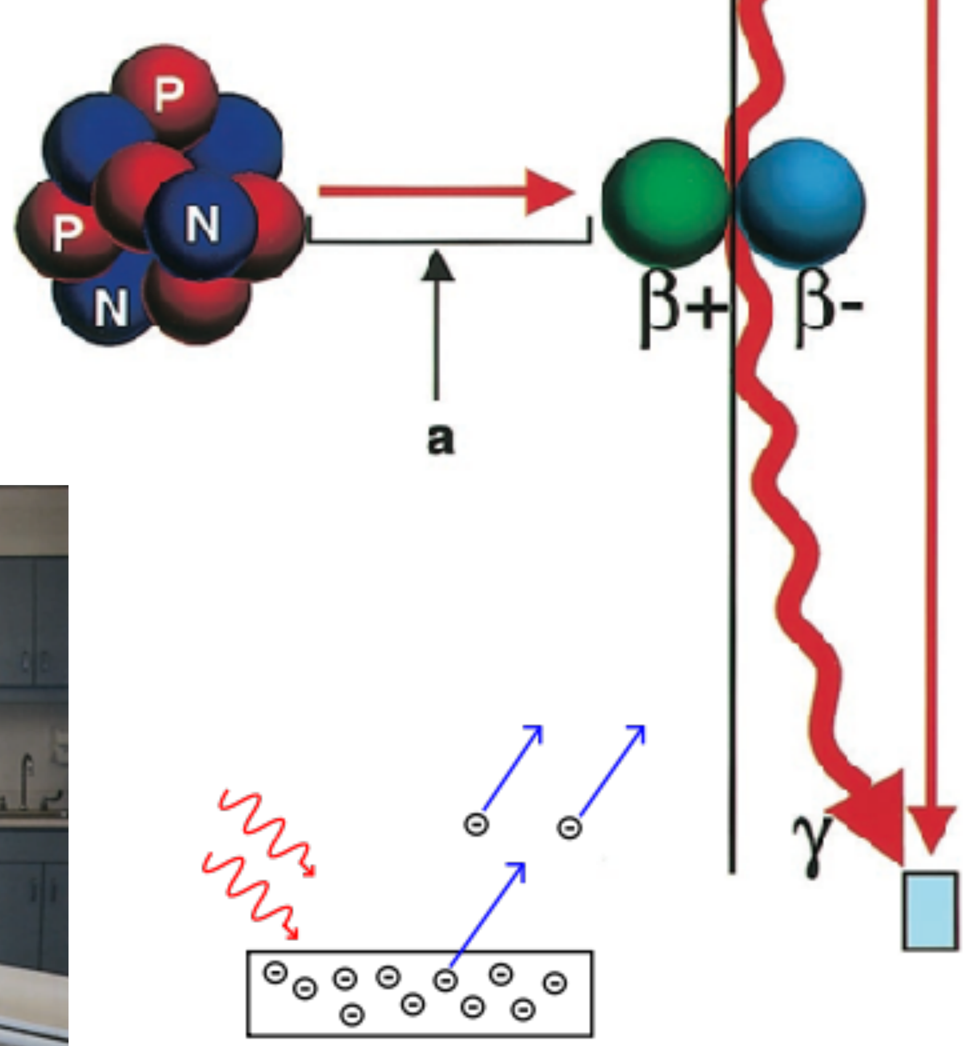
$$FWHM = a\sqrt{\left(\frac{d}{2}\right)^2 + b^2 + (0.0022D)^2 + r^2}$$

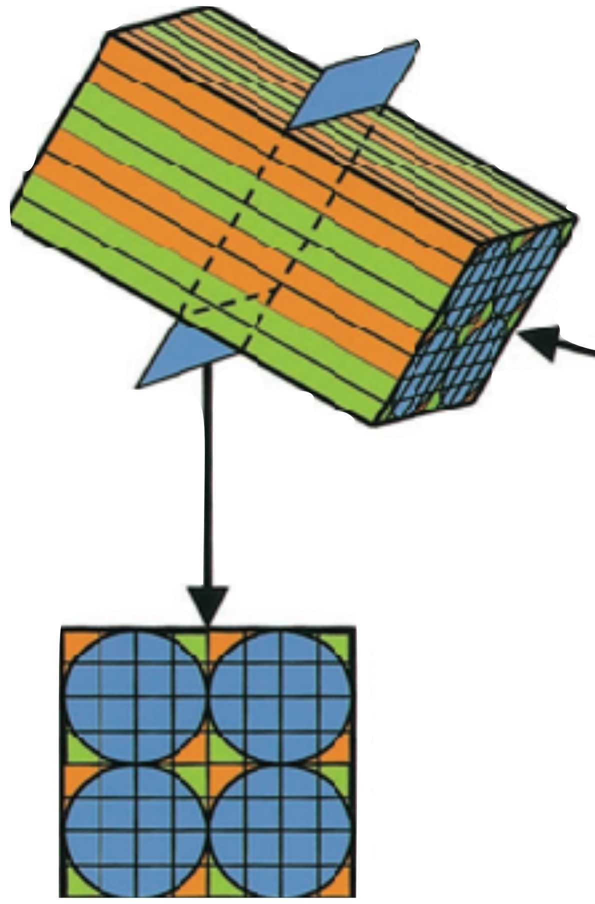


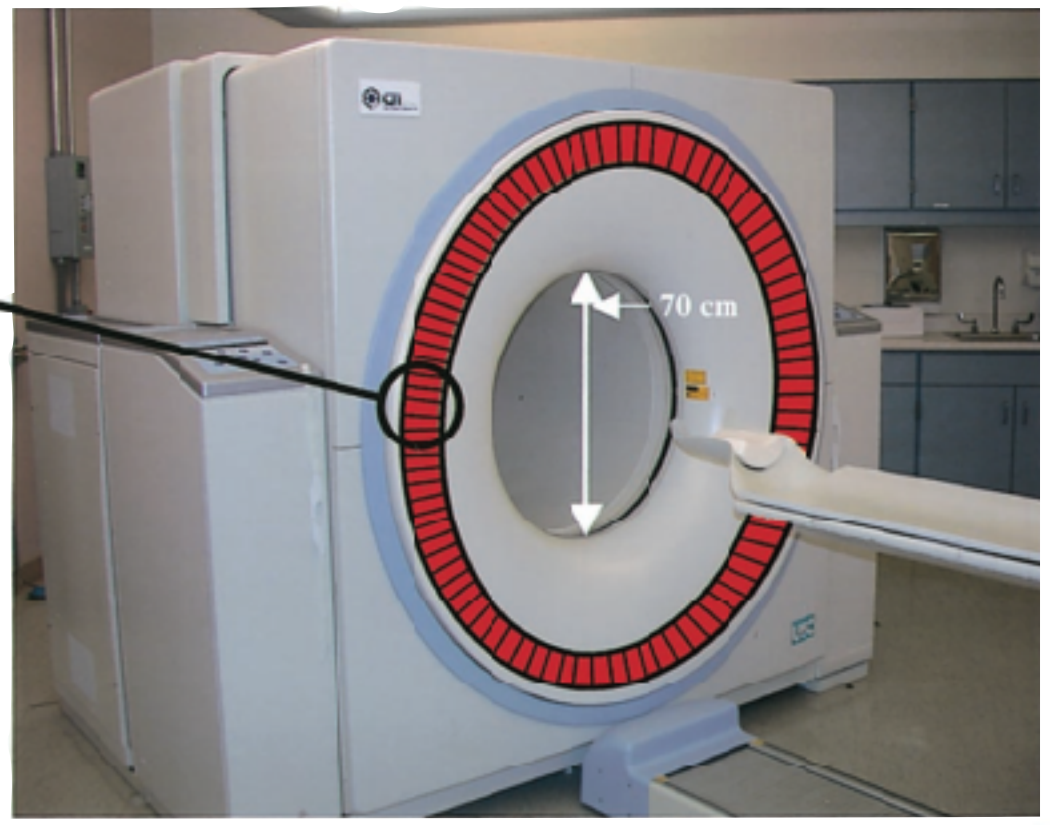


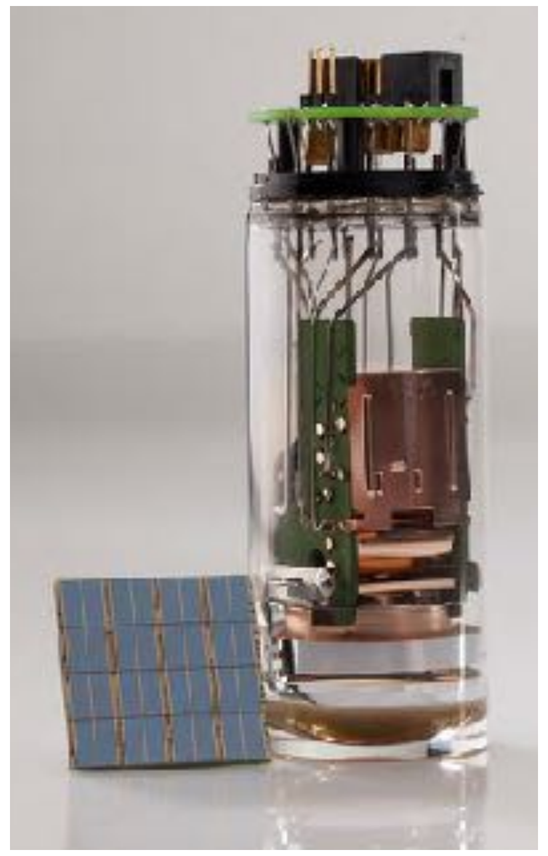


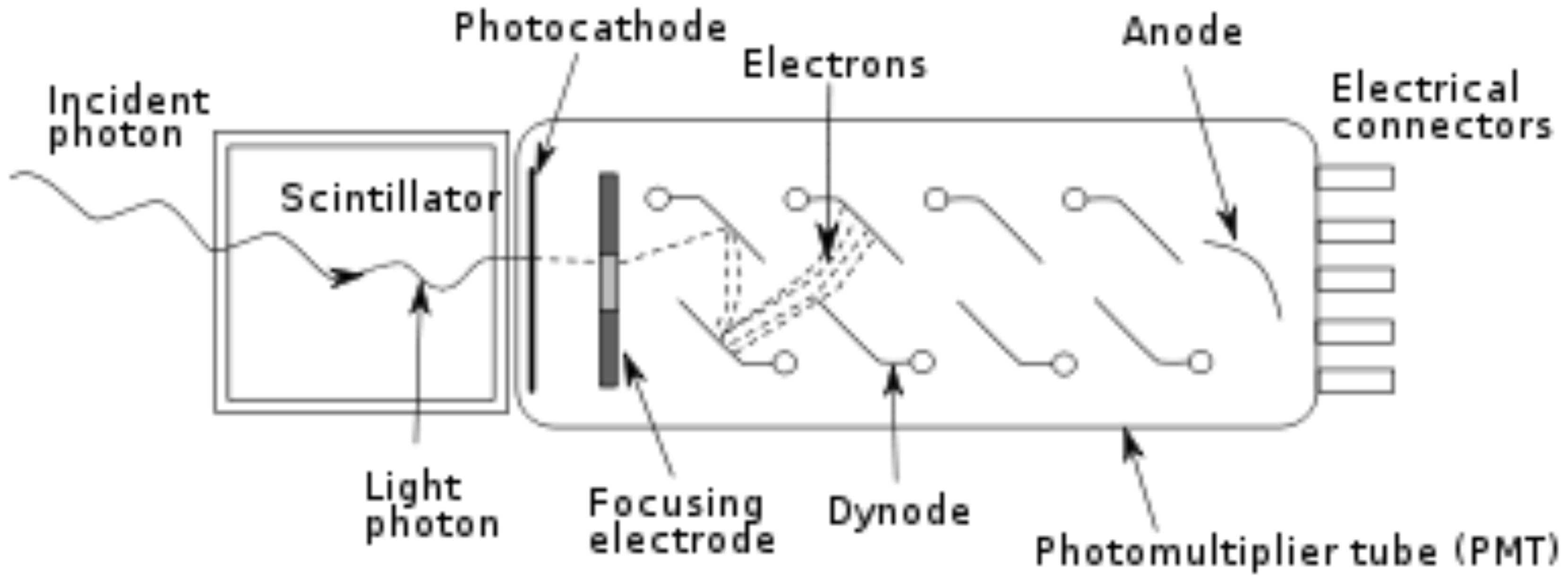


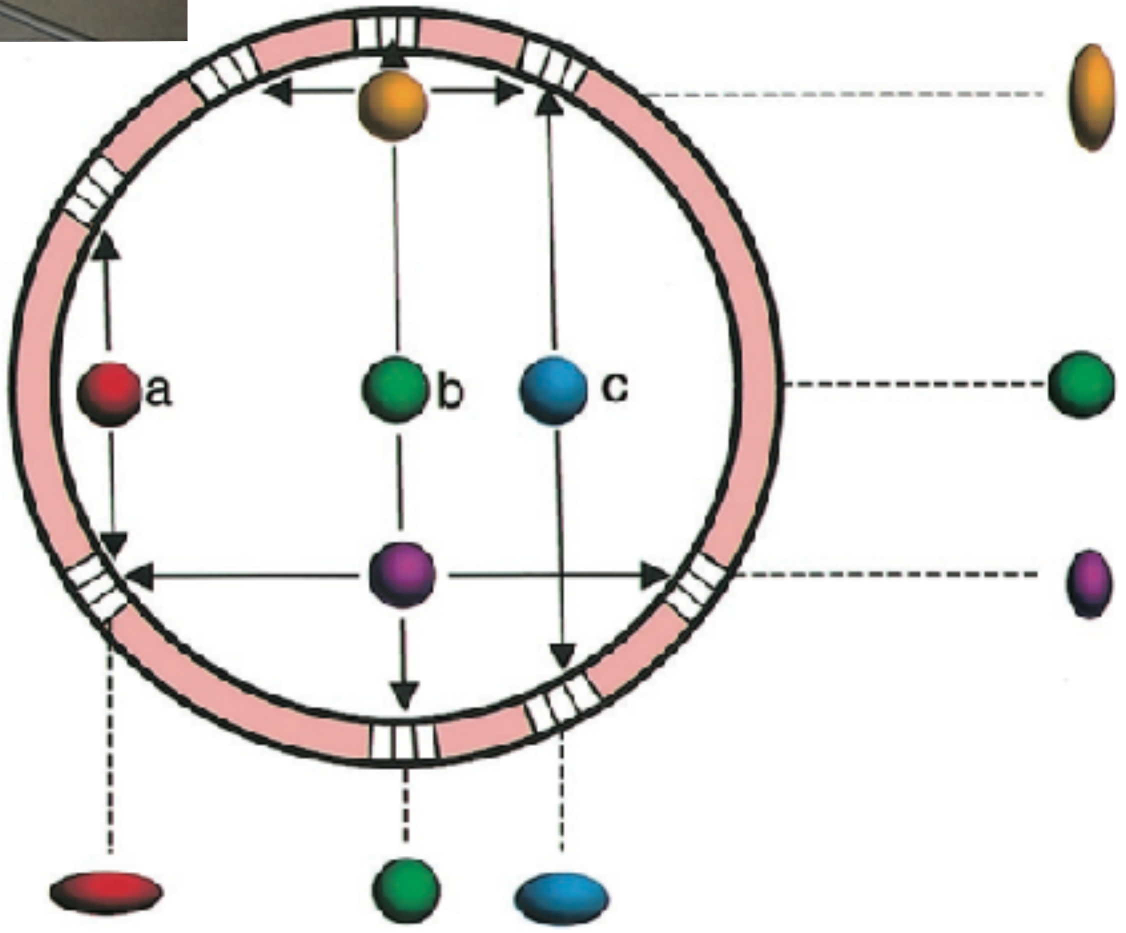








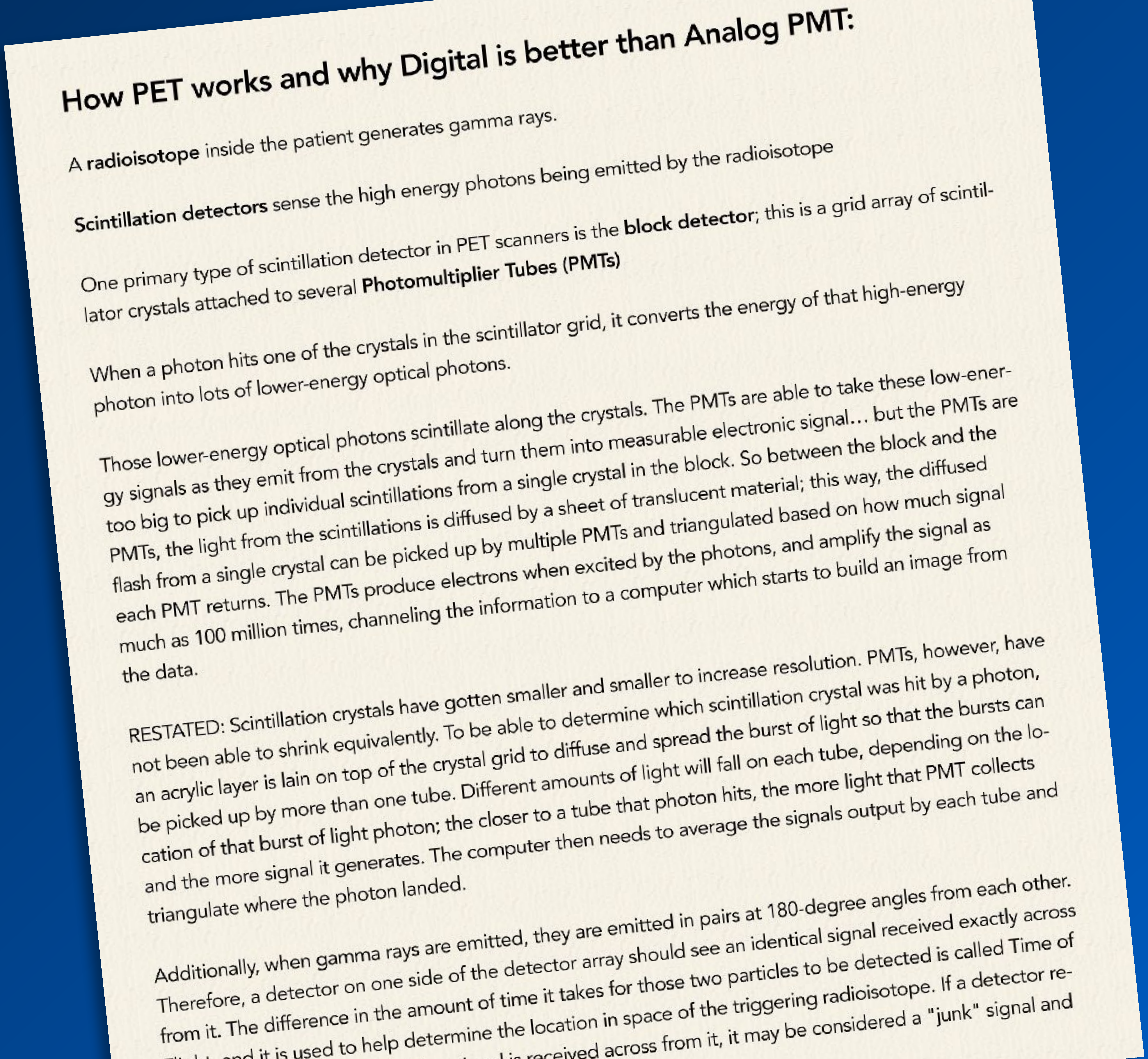




PROCESS:

The result of all the research was a written narrative that attempted to describe, in relatively simple terms, the process and the benefits of DPC vs. PMT.

Once the client had vetted the simplified narrative, we proceeded to brainstorm how to present all of the information in simple, engaging chunks of interaction. This all needed to be broken down in a meaningful way that presented something of a story arc, into which the user could enter at any point.



How PET works and why Digital is better than Analog PMT:

A **radioisotope** inside the patient generates gamma rays.

Scintillation detectors sense the high energy photons being emitted by the radioisotope

One primary type of scintillation detector in PET scanners is the **block detector**; this is a grid array of scintillator crystals attached to several **Photomultiplier Tubes (PMTs)**

When a photon hits one of the crystals in the scintillator grid, it converts the energy of that high-energy photon into lots of lower-energy optical photons.

Those lower-energy optical photons scintillate along the crystals. The PMTs are able to take these low-energy signals as they emit from the crystals and turn them into measurable electronic signal… but the PMTs are too big to pick up individual scintillations from a single crystal in the block. So between the block and the PMTs, the light from the scintillations is diffused by a sheet of translucent material; this way, the diffused flash from a single crystal can be picked up by multiple PMTs and triangulated based on how much signal each PMT returns. The PMTs produce electrons when excited by the photons, and amplify the signal as much as 100 million times, channeling the information to a computer which starts to build an image from the data.

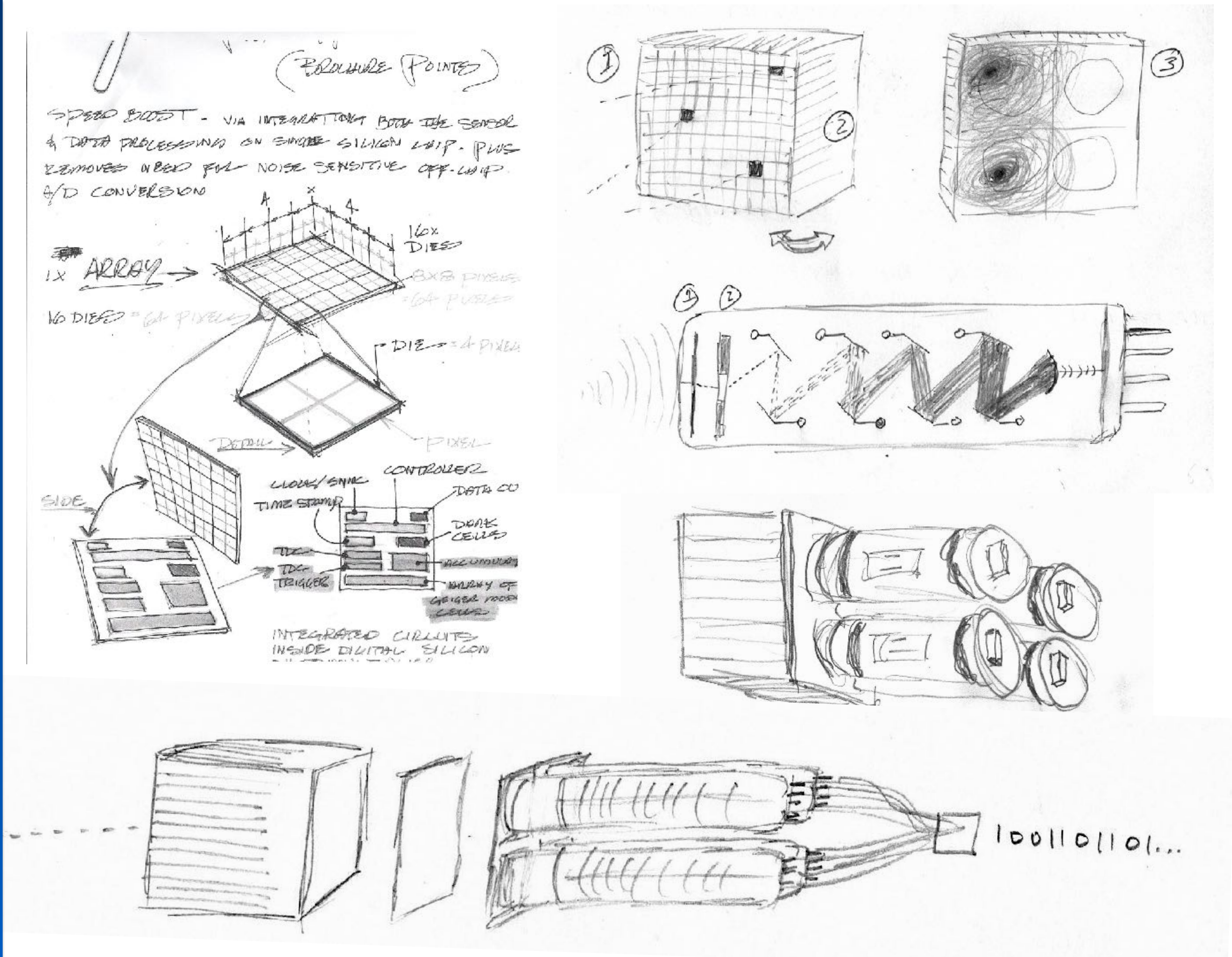
RESTATED: Scintillation crystals have gotten smaller and smaller to increase resolution. PMTs, however, have not been able to shrink equivalently. To be able to determine which scintillation crystal was hit by a photon, an acrylic layer is lain on top of the crystal grid to diffuse and spread the burst of light so that the bursts can be picked up by more than one tube. Different amounts of light will fall on each tube, depending on the location of that burst of light photon; the closer to a tube that photon hits, the more light that PMT collects and the more signal it generates. The computer then needs to average the signals output by each tube and triangulate where the photon landed.

Additionally, when gamma rays are emitted, they are emitted in pairs at 180-degree angles from each other. Therefore, a detector on one side of the detector array should see an identical signal received exactly across from it. The difference in the amount of time it takes for those two particles to be detected is called Time of Flight and it is used to help determine the location in space of the triggering radioisotope. If a detector re-
… is received across from it, it may be considered a "junk" signal and

SKETCHES:

Since the Tech Oveview was to be the meat-and-potatoes of the Exploratorium, we began to find the best way to tell that story first. Several rounds of pencil sketches gave us the broad strokes of what we wanted to show.

We considered many ideas that would have been too involved for the timeline; the Exploratorium was only one of dozens of elements that we created for Philips' digital presence at RSNA.

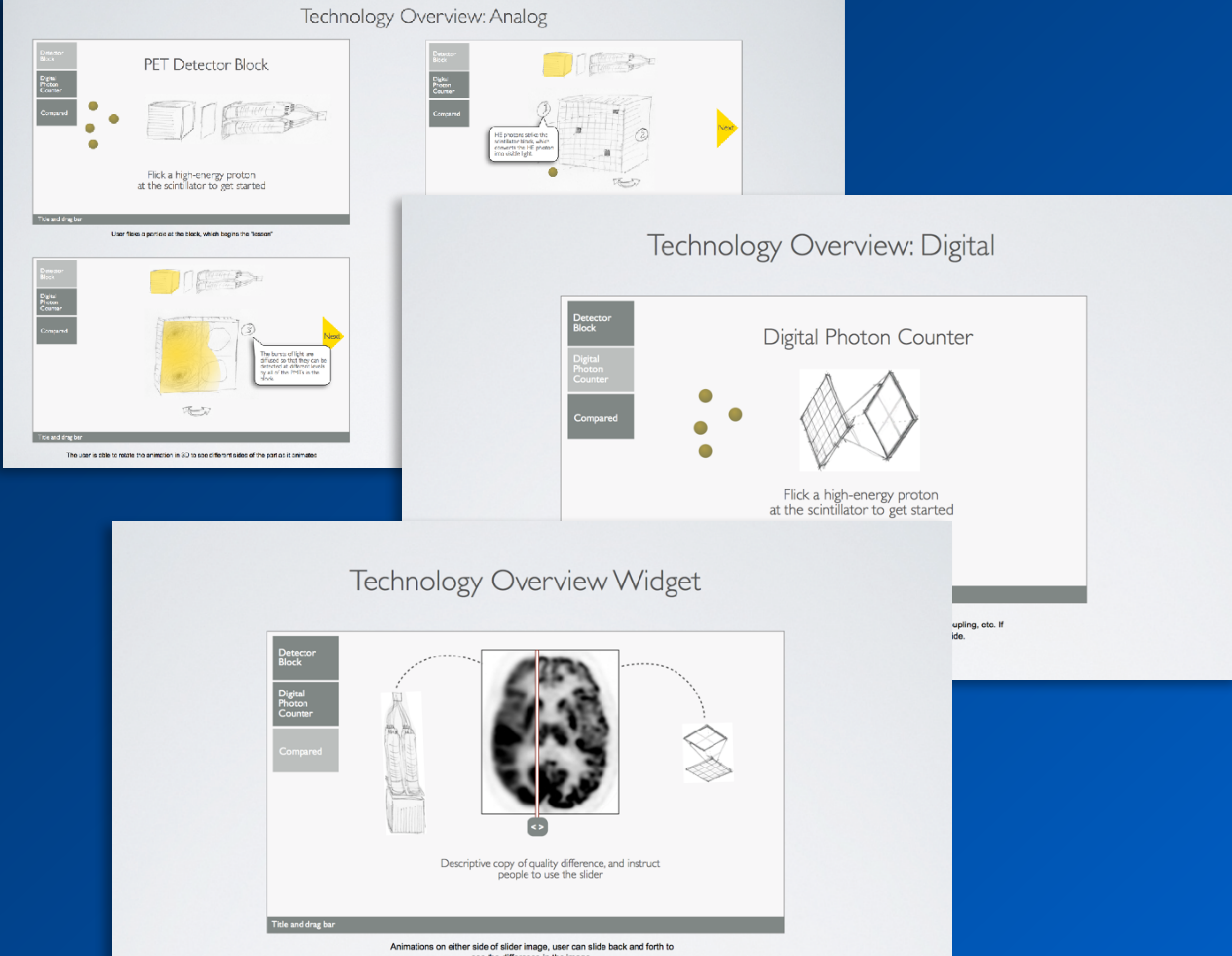


STORYBOARDS:

The next stage of the process was for the technical overview only, as the most linear and complex element.

We combined storyboards and wireframes to begin defining the four “widgets” upon which we had settled. Traditional flows and wireframes were unnecessary given the simplicity of the interactions, and were not an option on our accelerated timeline.

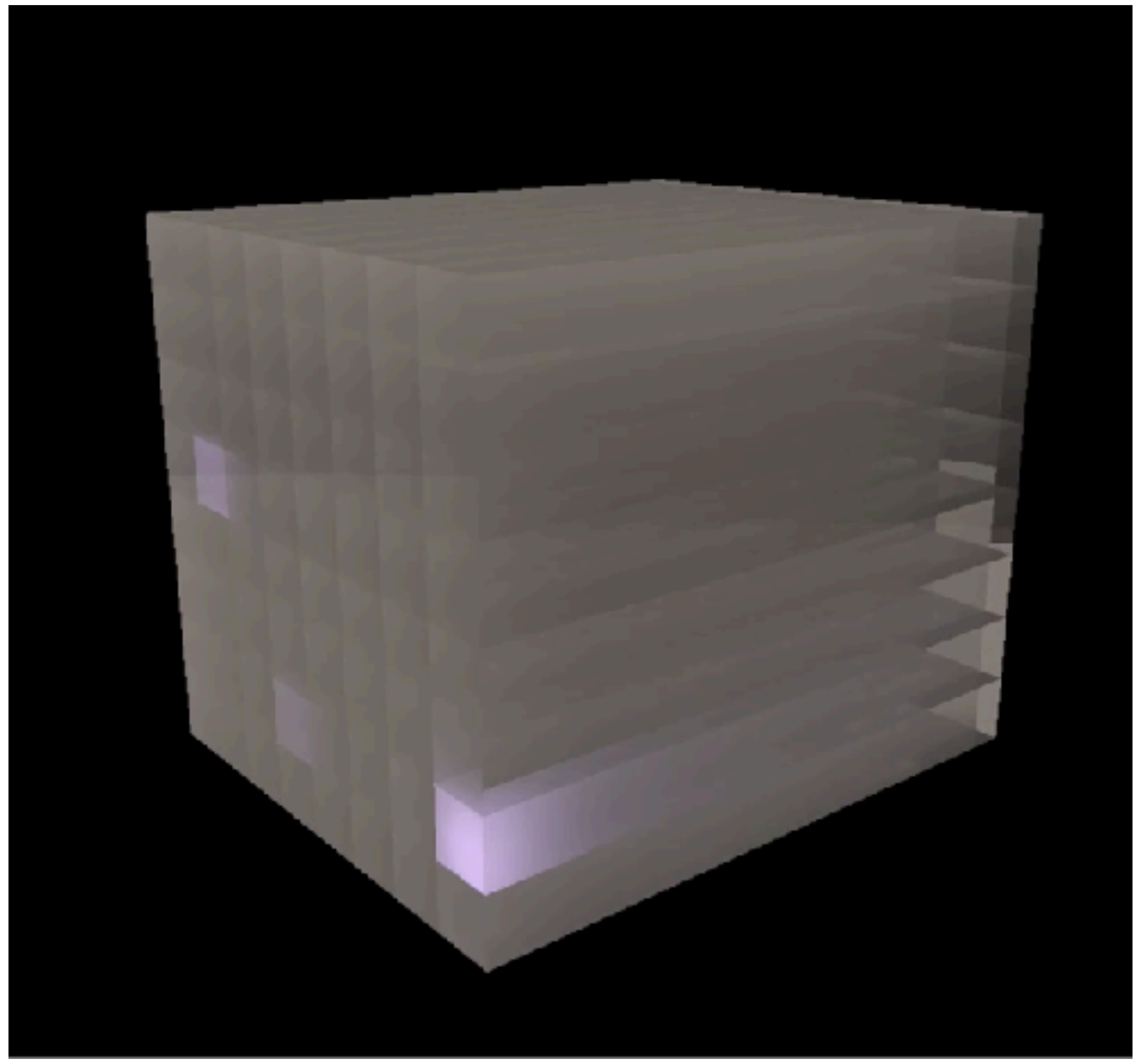
Each widget would serve a different purpose: introducing the concept, showing the benefits, and giving users hands-on experiences to see the quality differences.

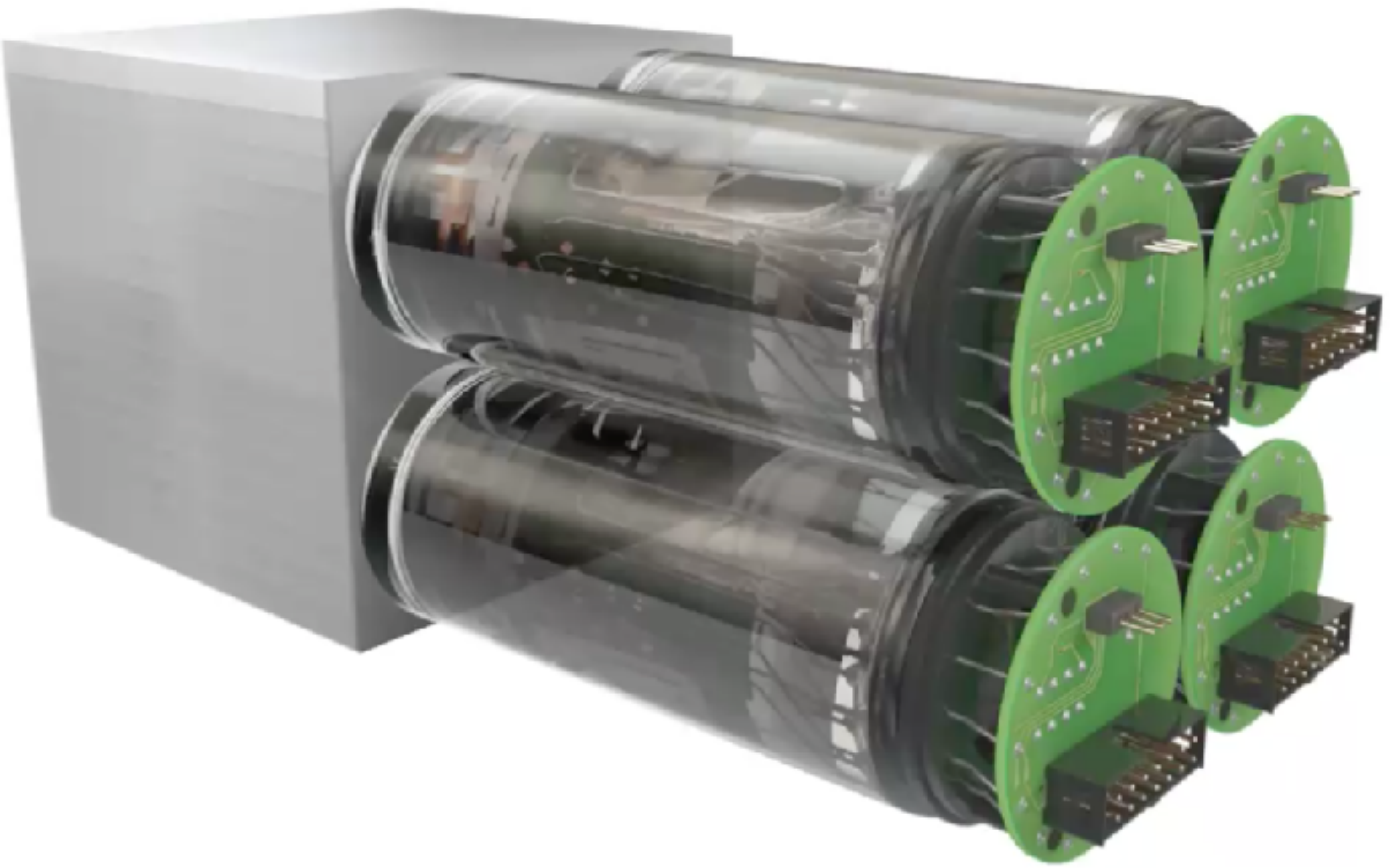


ASSETS:

As we determined the elements we needed, we had our 3D modeler create proof-of-concept pieces, and then refine them into final art for our technical and benefits widgets.

Meanwhile, we collected and formatted clinical assets for the gallery widgets, and began in earnest the design of the Exploratorium itself.

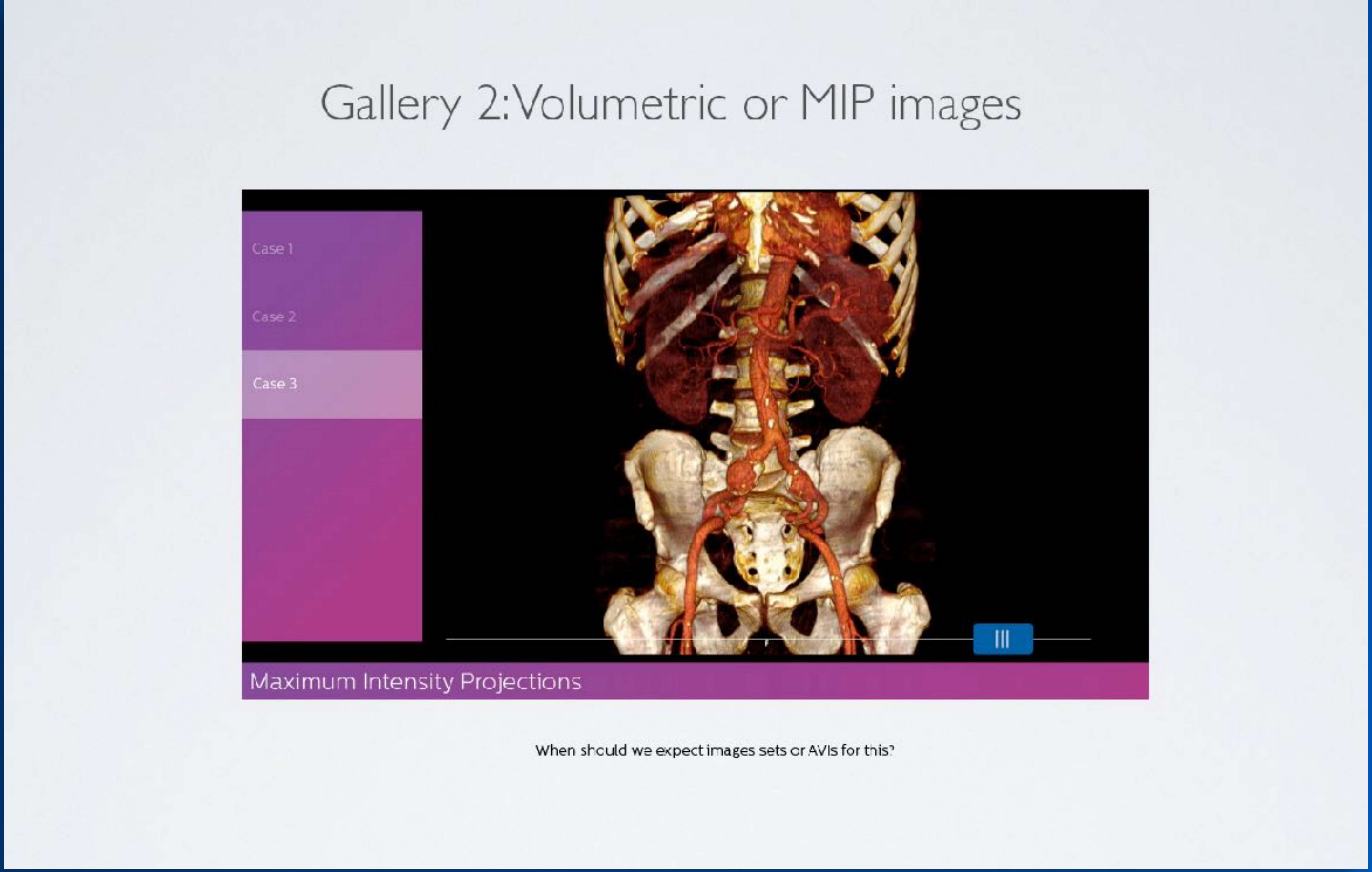




"MOCKFRAMES":

The final "mockframes," as we called them, were a hybrid of simple wireframes and the evolving visual design of the project.

We used this approach to conserve time and resources, working under tight deadline to develop both the functionality and the look of the Exploratorium, even as Philips was deep in the process of developing and revising its own new brand standards.



DESIGN:

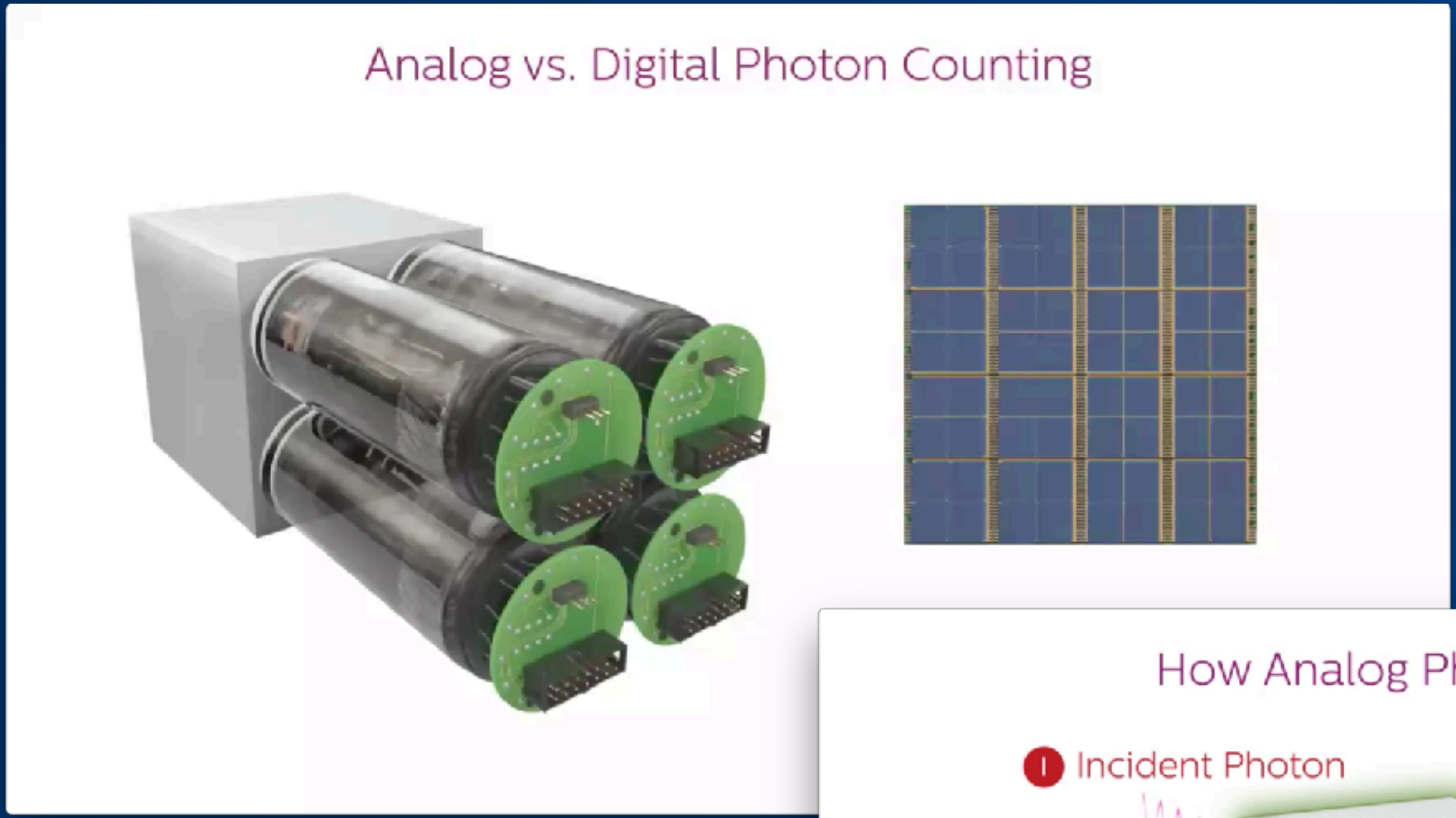
Visual designs, based around brand colors specified for each technical team, evolved alongside the “mock frames.”

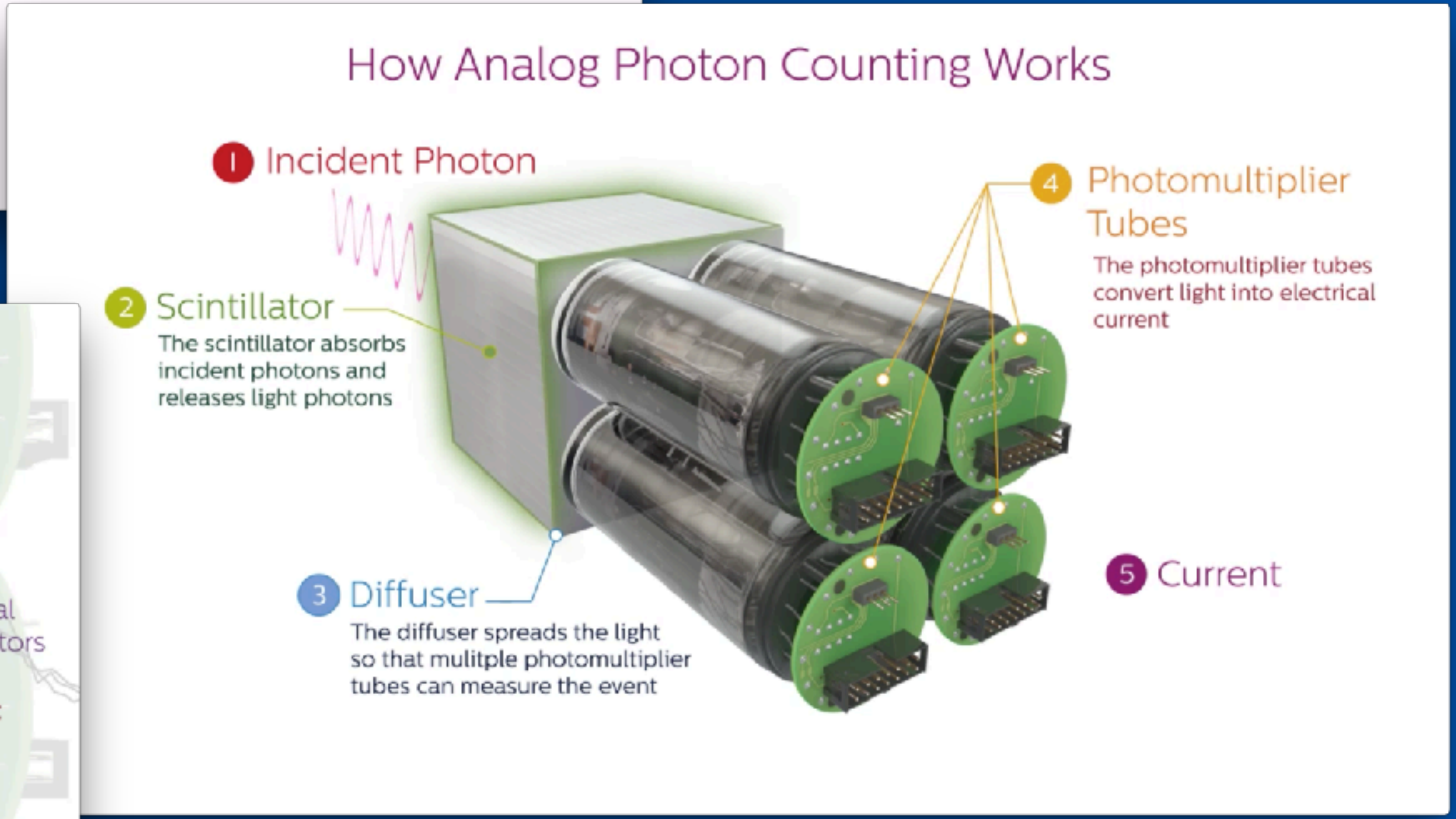
Notably, when other departments learned about what AMI was doing, three of them called upon us to create widgets for their own teams, each with its own needs and goals.

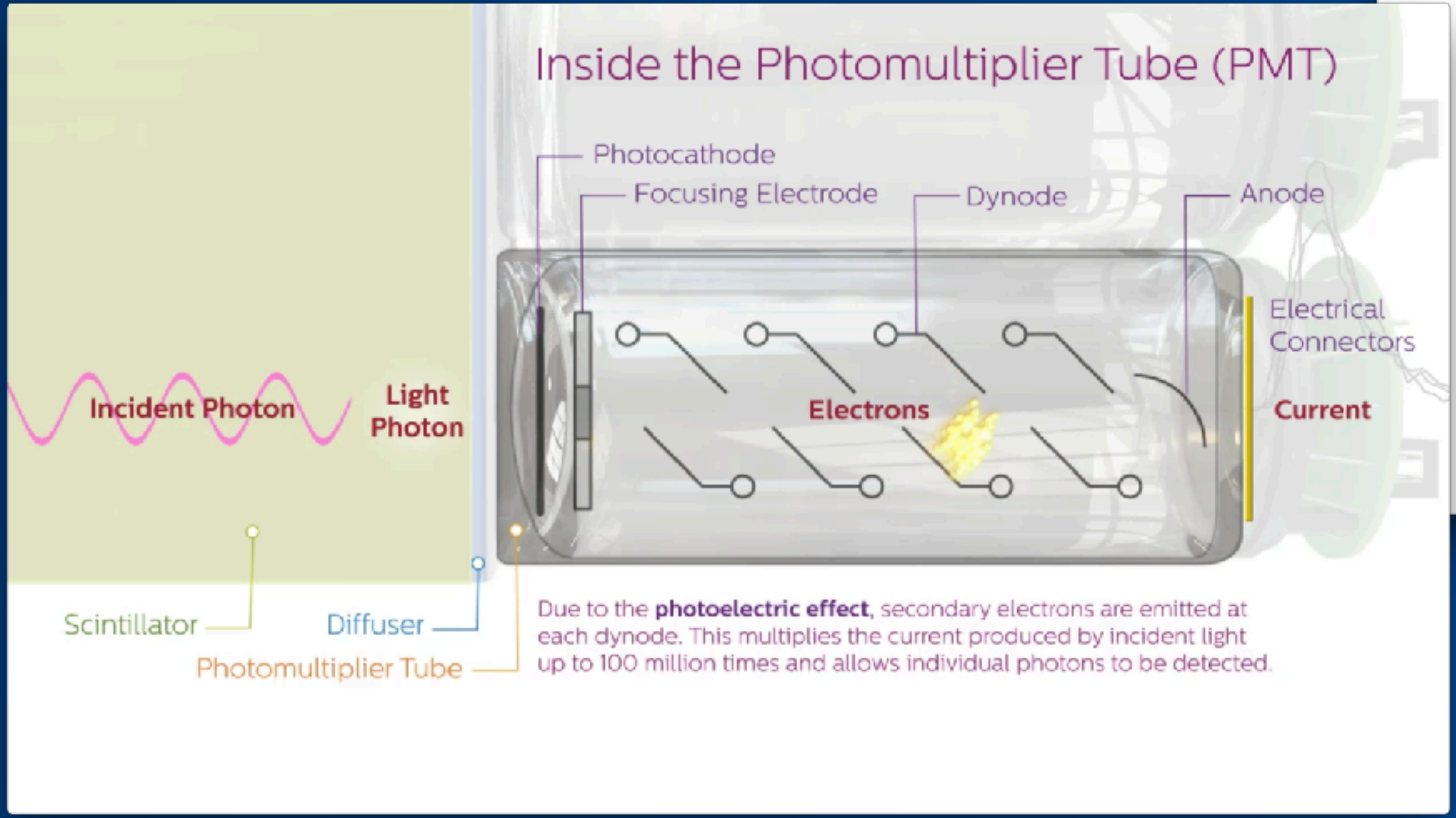
In all, we created Exploratorium content for four initial teams around RSNA 2013, and a fifth team that joined for RSNA 2014.

VIDEO:

The centerpiece of the Tech Overview widget was a simple but visually striking interactive video presentation* demonstrating both types of PET imaging and the benefits of Digital Photon Counting.





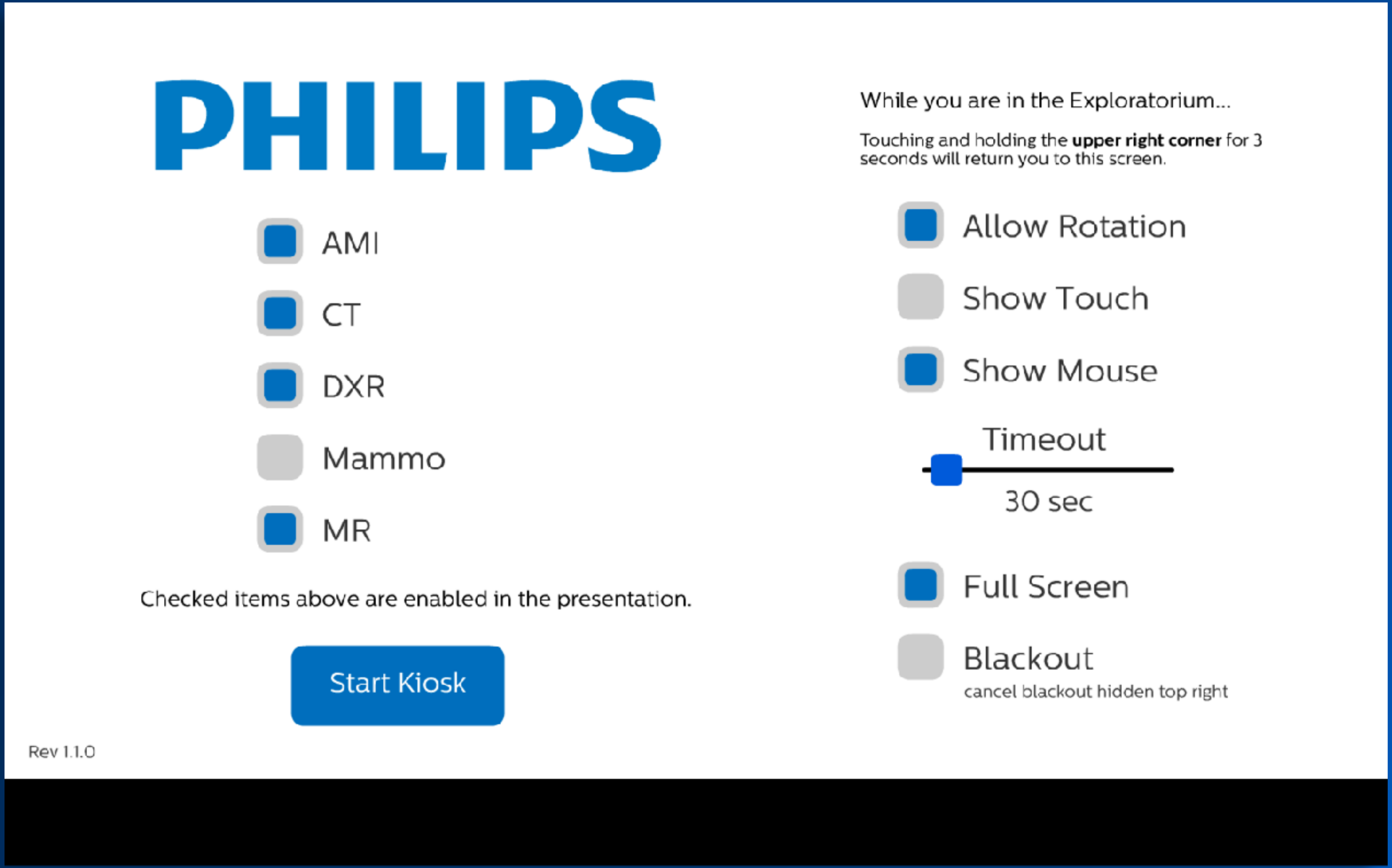


FLEXIBILITY:

At the heart of the Exploratorium is a highly flexible set of Adobe AIR modules.

Clients can tweak many aspects of each widget through the JSON configuration file, allowing for on-the-fly changes to content, functionality, and settings for various touch screens.

Many of the higher-level settings can be quickly configured in the administration panel as well.



RESULTS:

The success of the Exploratorium project exceeded the expectations of both Philips and Hyperactive.

Based on badge tracking, screen analytics, and direct customer feedback at RSNA, the AMI Exploratorium consistently garnered some of the highest traffic and longest interactions of the five Philips modalities over the course of RSNA.

As we had suspected, the takeaway was clear: Make it simple, attractive and interactive, and let people just explore on their own.

RESULTS:

Based on the success and easy configurability of the tool, every department requested that we convert their Exploratorium content for iPads, laptops, web-friendly HTML/JS versions, and even user-configurable tools that they could change on the fly.

In addition to bringing significant business to Hyperactive and great satisfaction to our clients at Philips, the Exploratorium was a finalist for a 2014 MITX Innovation Award in Healthcare Excellence.

2014 MITX AWARDS FINALIST

Thank you!

Matt Laurence
mattlaurence@gmail.com