

[ WARNING: FLASHING LIGHTS IN VIDEOS ]

*COLLIDERSCOPE:*  
REACHING NEW AUDIENCES W/  
ELECTRONIC(S) MUSIC

LAWRENCE LEE

PRODUCTION WITH TOVA HOLMES (UCHICAGO)

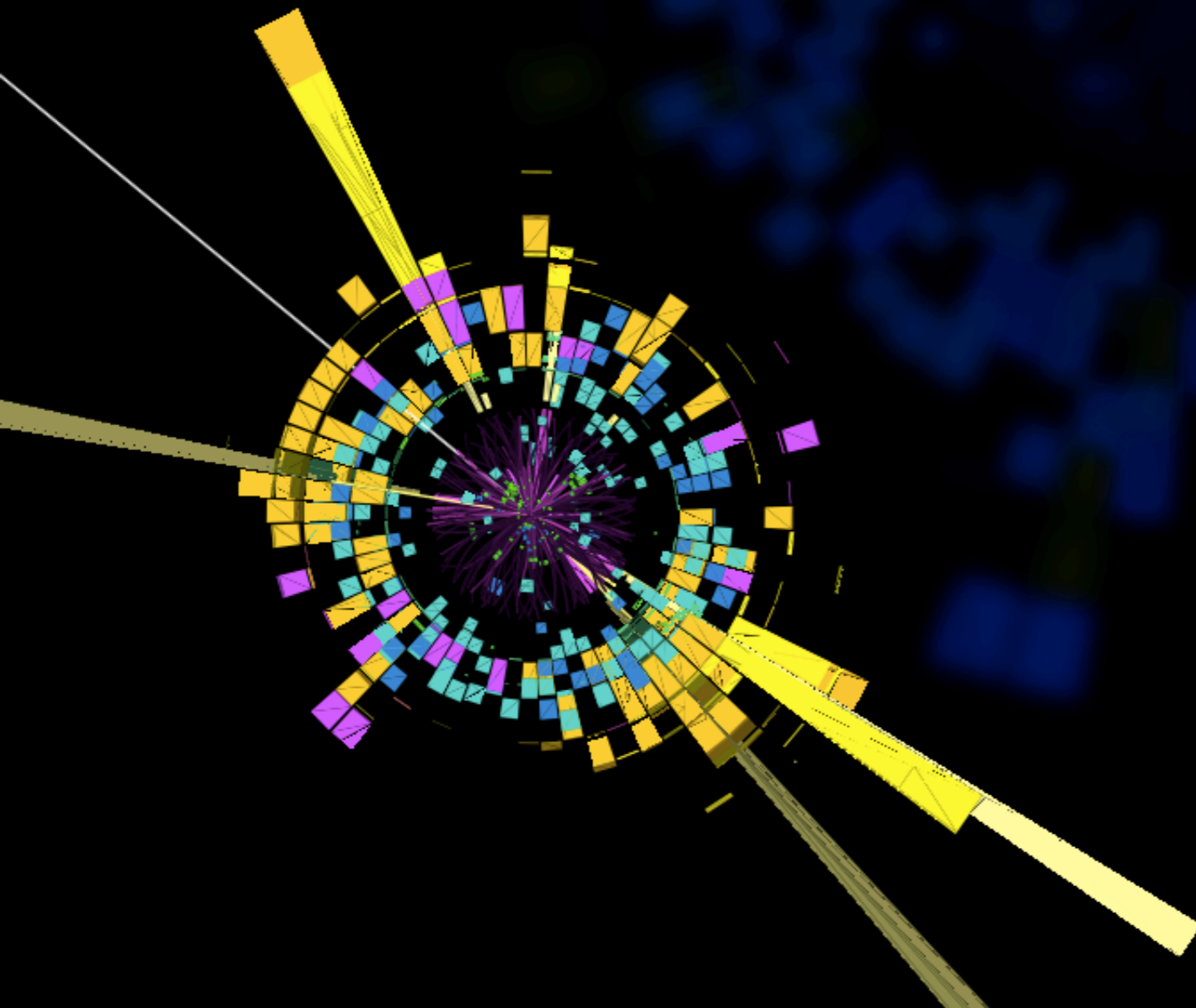


HARVARD  
UNIVERSITY

011A0K2111

# I WORK ON ATLAS

WHEN I'M NOT SEARCHING FOR BSM PHYSICS,  
I'M IN THE LAB WORKING ON OUR MUON UPGRADE

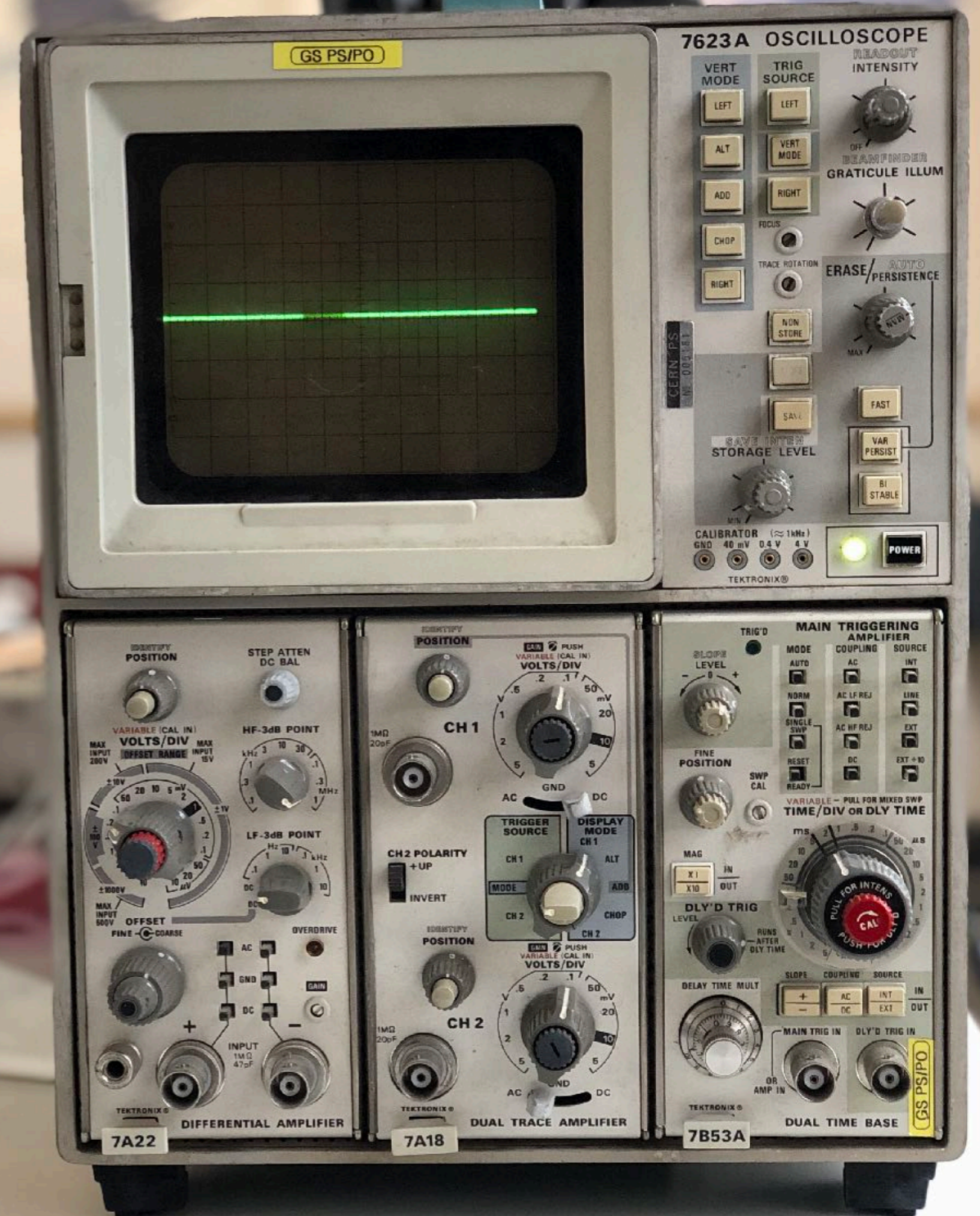


In lab, I work a lot with scopes...

Remember old analog scopes?

So satisfying to play with

...though a lot less practical...



# "Oscilloscope music"



Jerobeam Fenderson - Planets

538,751 views

👍 11K    💬 114    ➦ SHARE    ≡+ SAVE    ...

What if you make stereo sounds

Whose waveforms draw images if piped into a scope in XY mode...

[YouTube Channel for Jerobeam Fenderson](#)

R vs T

L vs R

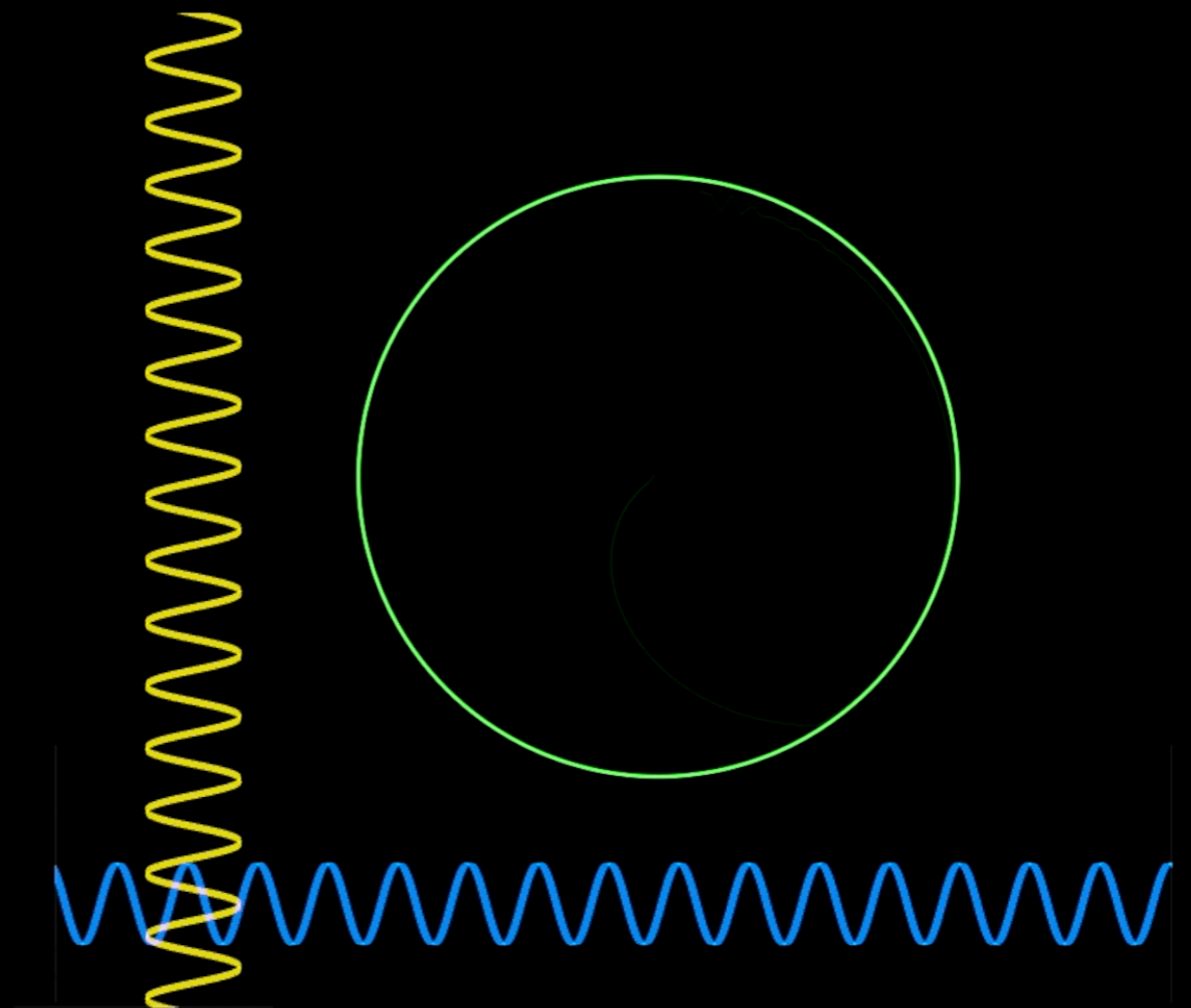
L vs T

[YouTube Link](#)

Audio waveform encodes the visual show.

Play WAV file [[cern.ch/ColliderScope](http://cern.ch/ColliderScope)] into a scope and see the images

**Shape** ↔ **Timbre**  
**Speed** ↔ **Pitch**



[YouTube Link](#)



# The project has been a huge success.

**ColliderScope** is at CERN. Published by Larry Lee [?] · April 2 · Meyrin · [Like Page](#)

Oscilloscope Music Tour of the ATLAS Experiment at CERN's Large Hadron Collider

Warning: Flashing Lights

Check out ColliderScope — Reconstruct the ATLAS Experiment at CERN detector CERN with the stereo waveforms of music! Watch the video, or pump the audio into an oscilloscope, to see a tour of the detector.... [See More](#)

**Oscilloscope Music Tour of ATLAS Experiment**  
03:09

**Performance for Your Post**

- 76,160 People Reached
- 15,008 3-Second Video Views
- 1,136 Reactions, Comments & Shares

666 Like	92 On Post	574 On Shares
105 Love	20 On Post	85 On Shares
11 Haha	3 On Post	8 On Shares
41 Wow	4 On Post	37 On Shares
2 Sad	0 On Post	2 On Shares
1 Angry	1 On Post	0 On Shares
103 Comments	15 On Post	88 On Shares
211 Shares	195 On Post	16 On Shares

**4,864 Post Clicks**

1,235 Clicks to Play	99 Link Clicks	3,530 Other Clicks
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**NEGATIVE FEEDBACK**

- 12 Hide Post
- 2 Hide All Posts
- 0 Report as Spam
- 0 Unlike Page

Reported stats may be delayed from what appears on posts

**Get More Likes, Comments and Shares**  
Boost this post for Fr.10 to reach up to 3,500 people.

**76,160** People Reached | **6,000** Engagements | [Boost Post](#)

97 Reactions | 13 Comments | 195 Shares

[Like](#) [Comment](#) [Share](#)

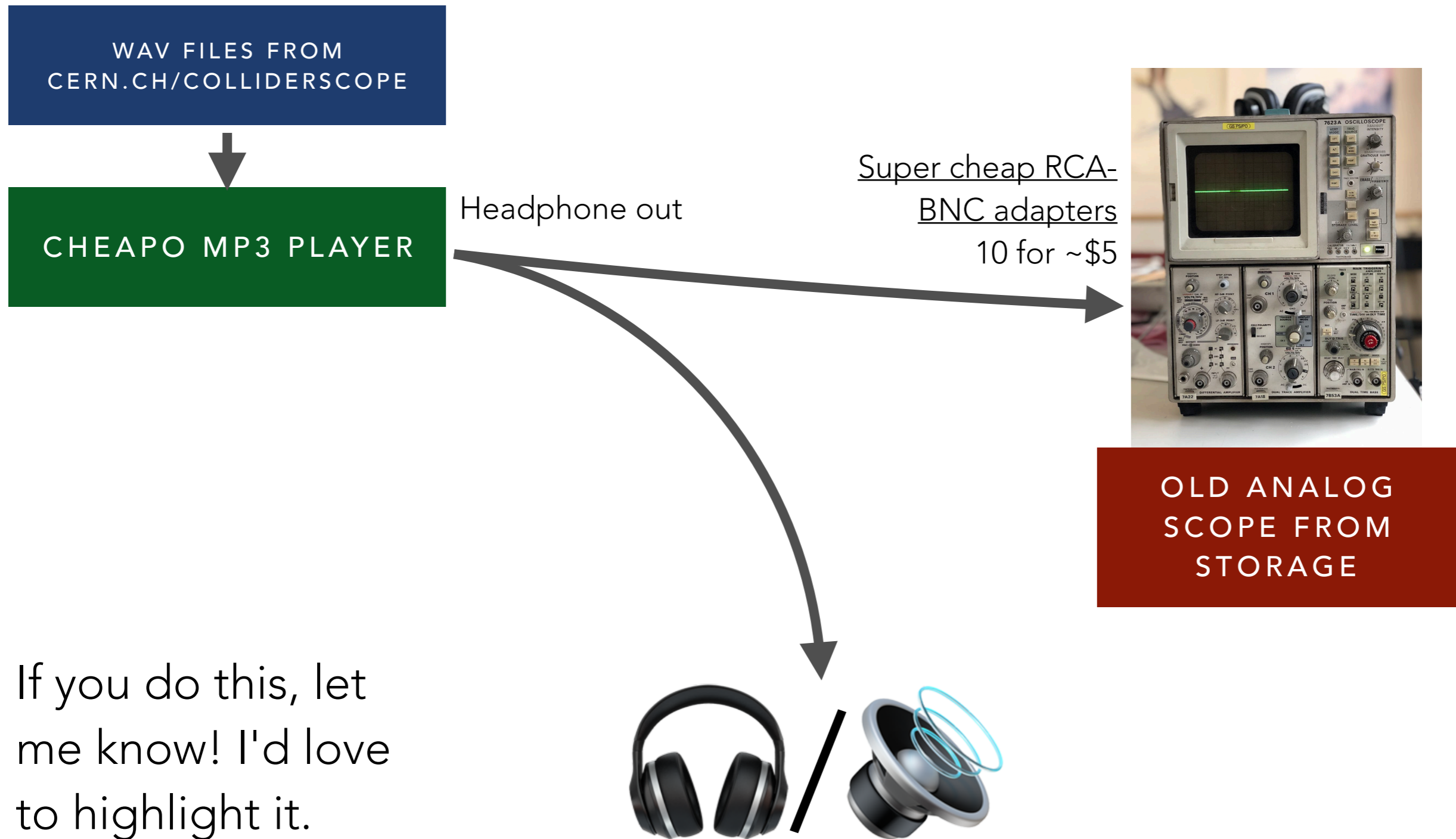


ATLAS Experiment Tour @ CERN by ColliderScope on ScopeMusicClock

Someone even played it on their own scope and posted it to YouTube! [User: konohh](#)



# Easy/cheap outreach display at your institute!



If you do this, let me know! I'd love to highlight it.

# ColliderScope @ Music Festivals



## A summer of festivals for CERN

This summer CERN scientists will be showcasing particle physics at festivals across Europe

28 JUNE, 2019 | By [Connie Potter](#)



The Physics Pavilion at the 2016 WOMAD festival received over 3600 visitors (Image: CERN)

For many, summer means attending an outdoor festival. Music festivals

CERN has a growing program of Science Pavilions at music festivals, run by Connie Potter

Created songs to introduce the programs and have been received well with audiences

[YouTube Link to Roskilde Intro](#)





CERN & COMENIUS UNIVERSITY PRESENT  
 CERN A UNIVERZITA KOMENSKÉHO UVÁDZAJÚ



*A unique live set  
 using vintage  
 lab equipment  
 from CERN*

Lawrence Lee  
 Harvard University

*Unikátny live-set  
 ktorý využíva  
 vintage prístroje  
 z laboratória  
 v CERN-e*

# COLLIDERSCOPE

EXPERIMENTAL MUSIC FROM EXPERIMENTAL PHYSICS  
 EXPERIMENTÁLNA HUDBA Z EXPERIMENTÁLNEJ FYZIKY



FRIDAY 12 JULY  
 PIATOK 12 JÚL

12 : 20

CCC CLUB

# ColliderScope Live

Huge privilege of being given a stage at **Pohoda Festival**. Biggest in country. 30k attendees.

Hour-long set at the stage for experimental electronic music

15 minute intro presentation:  
 LHC, the science of sound, electronics

Live 45 minute electronica/hip-hop set  
 w/ projected scope trace

Each shape is sampled and repitched to  
 make melodies that draw pictures

**[See clips from the set on YouTube](#)**



Photos: T. Holmes [UChicago]

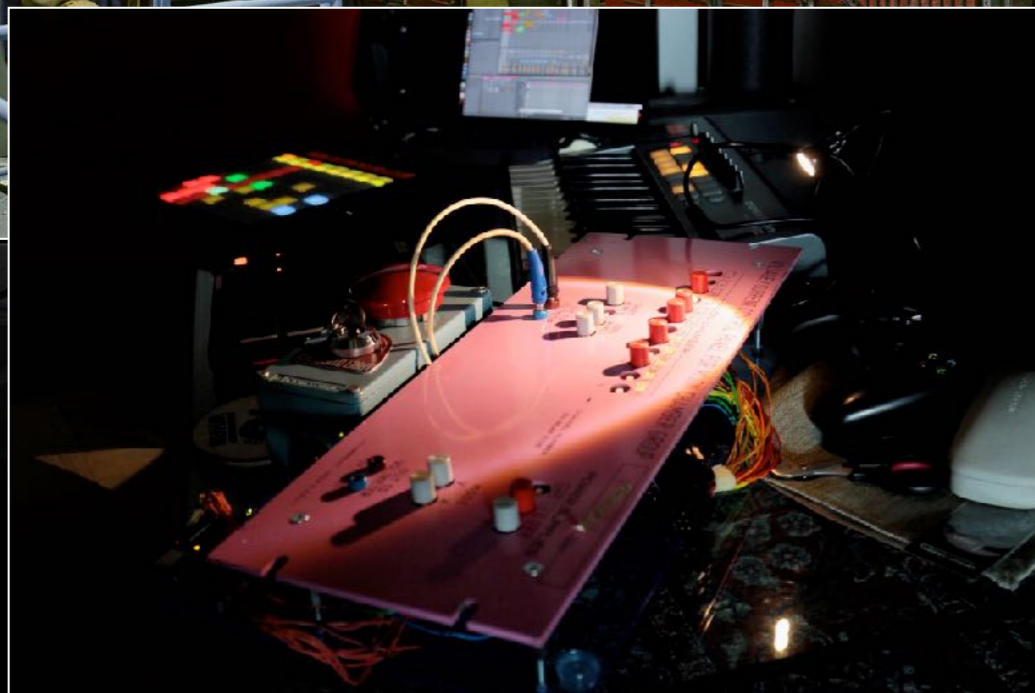


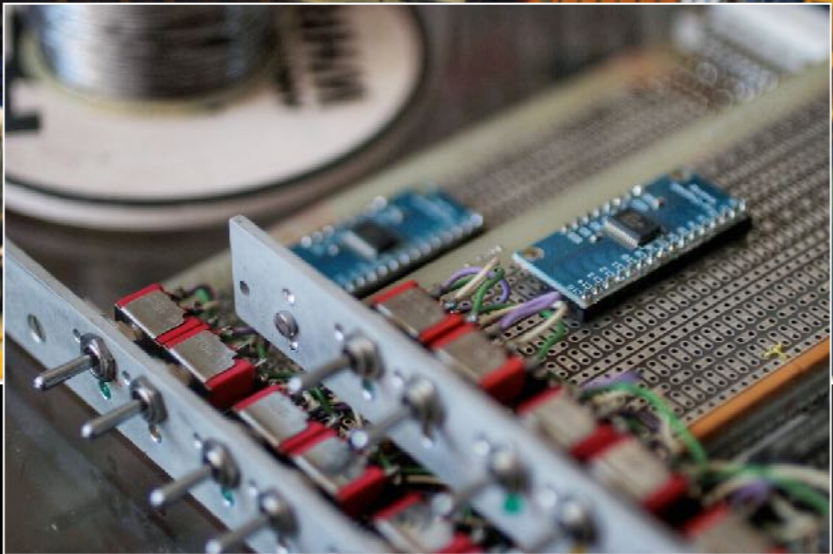
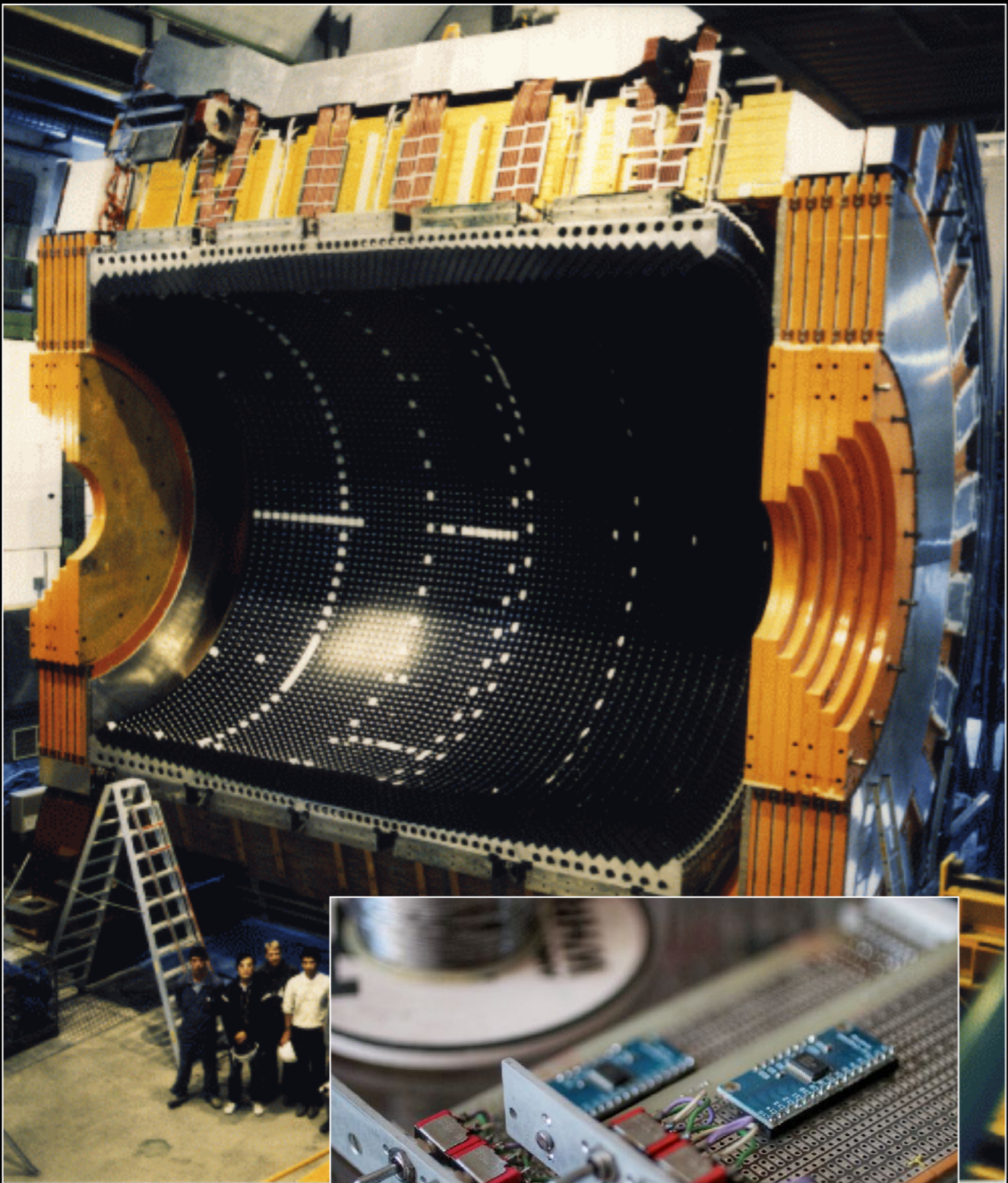
# Electronic(s) Music

Make live music with repurposed electronics from old experiments

Brings us full circle back to the electronics of particle physics

LV Control Panel for UA1 Muon System





NIM Power Supply  
from SSCL

VME Switch Array  
from OPAL

**Vintage Scope**



**UA1 Panel**



**Traditional Electronic Instruments**





REPORTÁŽ: Pohoda Festi x POHODA PREDSTAVILA F x +

https://protisedi.cz/pohoda-fe...

I chose a small stage, which I used to play for hours last year and enjoyed great musical insights, featured the project ColliderScope, founded by Lawrence Lee, an American. This particle accelerator man at CERN created parts of his old instruments with his musical instrument, which uses mathematical knowledge of the universe to produce sounds, and has done a great electronic set with his help.

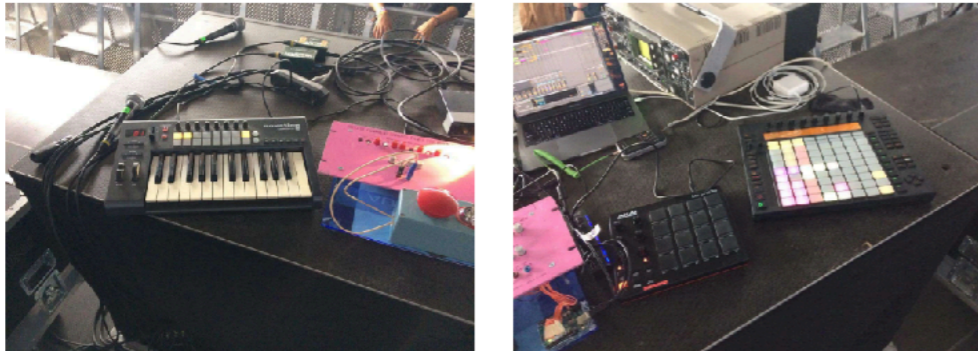


photo by Daniel Kopecký photo by Daniel Kopecký

After this musical introduction, the main stage has already begun to come to life through the sounds, and you suddenly did not know where to go, unless it was as clear as I did not miss P / ST, a pair of guys who met at DAMU and made it to the final round of Starter by radia Wave. At Pohoda it was their seventh concert at all, and for those who haven't experienced it yet, there is a possibility to visit Beseda u Bigbítu, where they will perform on the same day as creating similar WWW Neurobeat. Rapper Dan Kranich and musician Ivo Sedlacek send their audience to ecstasy. They are crowded with energy and power, they seem to want to conquer the world. Piece Landscape without a Door is a complex poetry in a cheeky design, has an existential aftertaste (but you know it, do you know?) And to this great musical component, I highly recommend and I tend to share the opinion of the group who stood by the railing with me - "This is my headliner! ". A nice bonus was 4 copies of the CD, whose metal wrappers were made by Dan rapper. Yes, we have it at home, a

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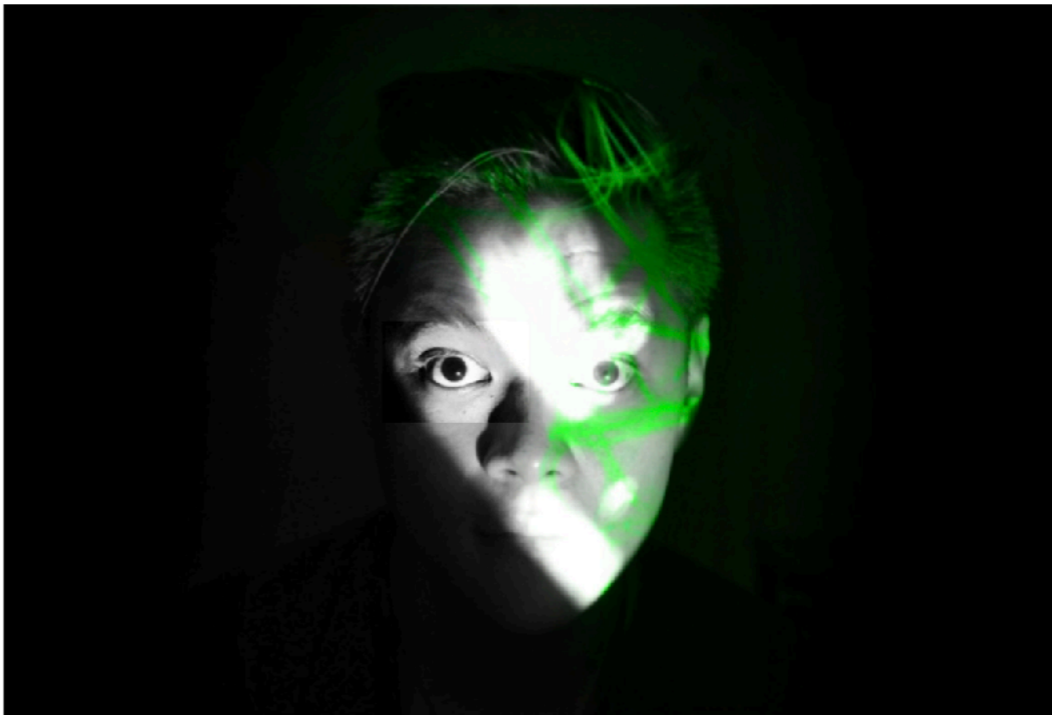
Translated from Czech

REPORTÁŽ: Pohoda Festi x POHODA PREDSTAVILA F x +

https://www.newmodelradio.s...

newmodel radio

ON AIR Shantel The Streets Where The Kids Have Fun Živé vysielanie



On Friday, at 12:20, Lawrence Lee will stop at the CCC Club to introduce the ColliderScope Experimental Music from Experimental Physics project.

**ColliderScope** is a musician and physics project on the Great Hadron Accelerator at CERN. With a unique form of synthesis, it paints dynamic images directly with the sound using an oscilloscope. Audio waves are designed to show images from the world of experimental particle physics. By converting old instrument waste from past musical instrument experiments, it creates a

Translated from Slovak



**Gives the public exposure to:**

PHYSICS OF SOUND

FOURIER ANALYSIS

ELECTRONICS

PARTICLE PHYSICS

**all on the dance floor or in  
their headphones**

A DJ is shown in profile, focused on their laptop at a music festival. The scene is dimly lit with warm, orange and red stage lights. In the background, a large, blurred crowd of people is visible, suggesting a vibrant festival atmosphere.

# Music is the ultimate form of outreach

Mostly everyone interacts with music  
It cuts deep into the core of our culture

There are ways for scientists to use music for  
**public engagement and outreach**

**Project not just the science geeks**, but  
Slovakian festival-goers looking to dance.

For the music world, I've made a **sample pack**  
for people to make their own LHC  
oscilloscope music!

Educate

Excite

OUR RESEARCH

PUBLIC CULTURE

DISTILLED  
VERSION FOR  
PUBLIC

SCIENCE-  
INJECTED  
CULTURE

Science

Public

A person is shown in profile, working on a laptop in a dark environment. The laptop screen displays a colorful, abstract visualization. In the background, a large, glowing green particle detector structure is visible, resembling a complex network of fibers or a particle detector component. The overall scene is dimly lit, with the primary light sources being the laptop screen and the green glow of the detector.

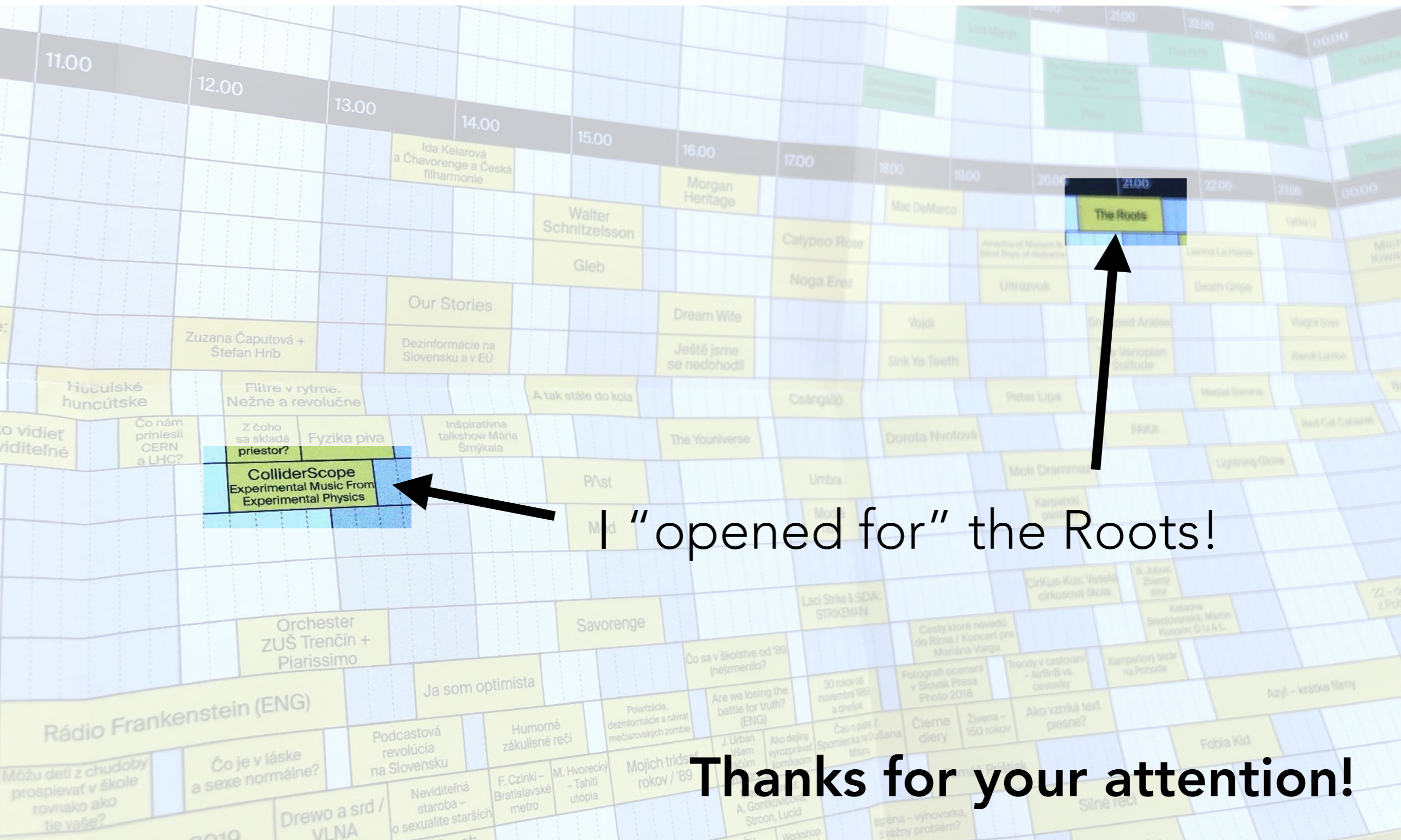
# I need your help!

Set up displays in your depts.

See [cern.ch/ColliderScope](http://cern.ch/ColliderScope) to download some WAV files.

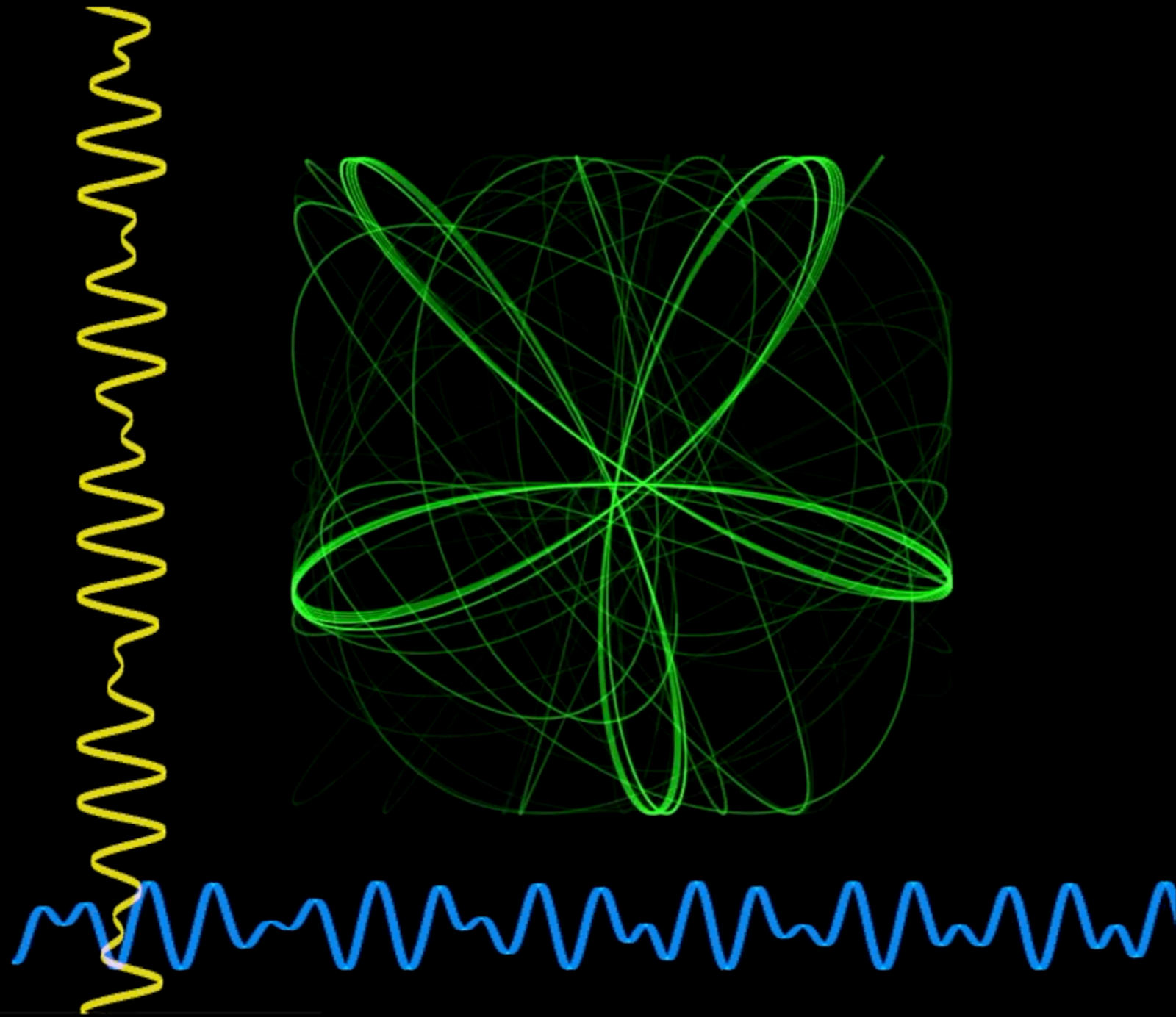
{Like, share, follow} x {[Facebook](#),  
[Instagram](#), [Twitter](#), [YouTube](#)}

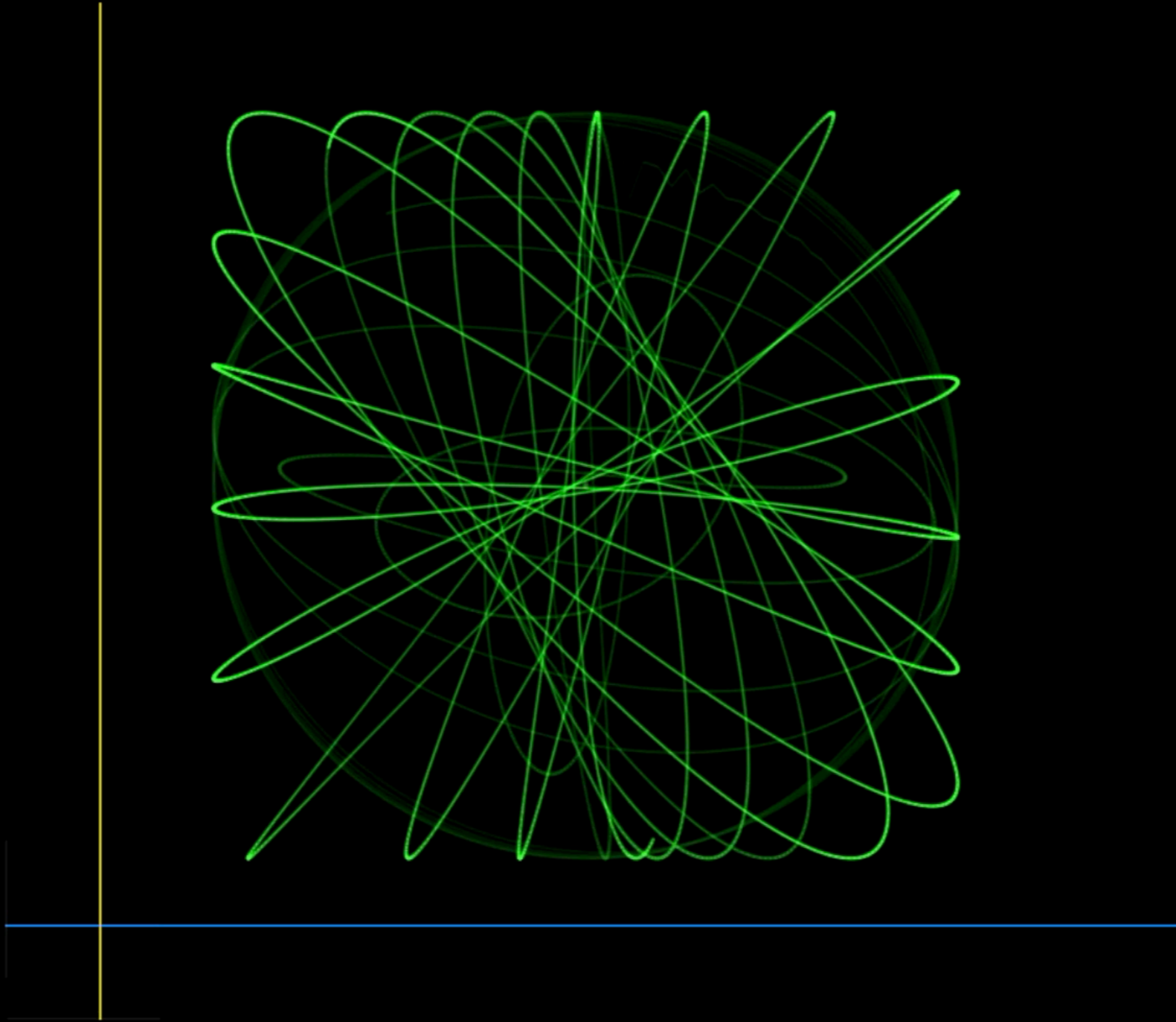
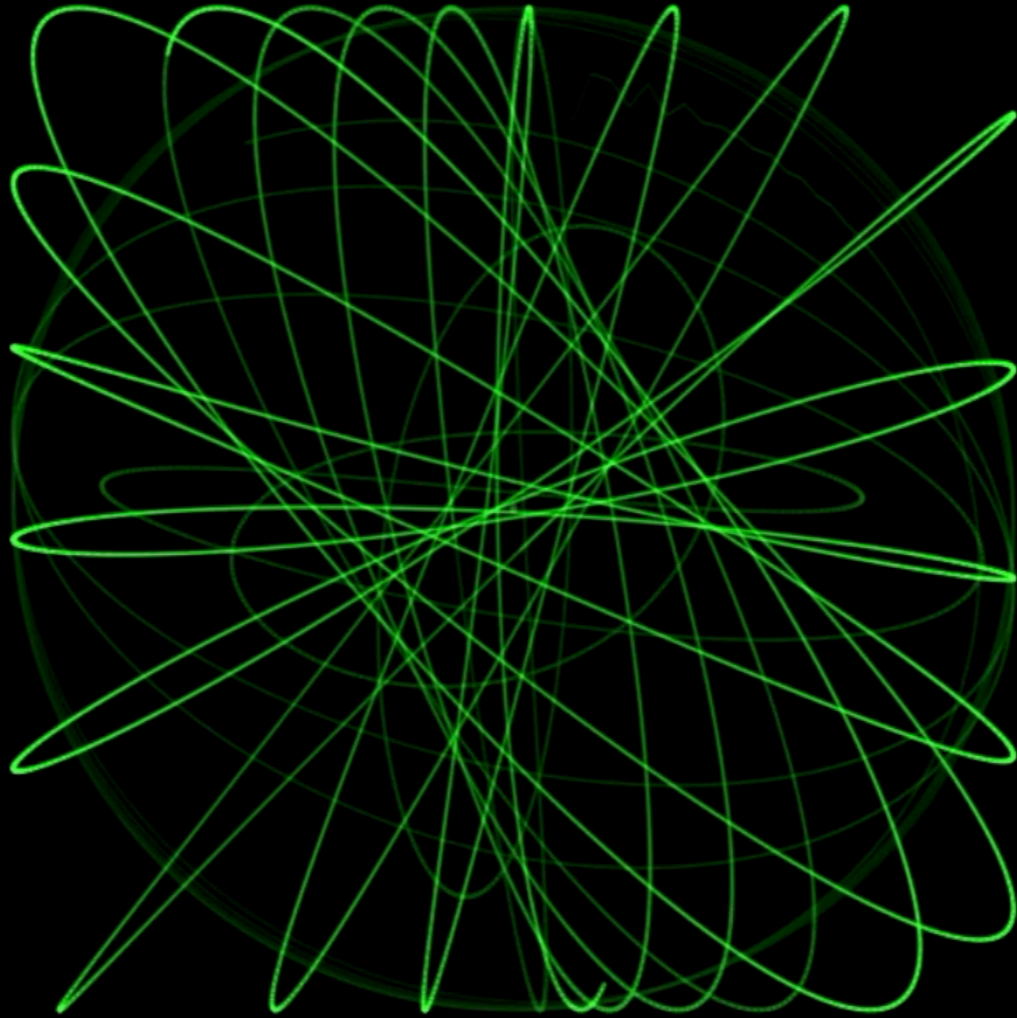
Reach out if you want some physics-themed music at your next outreach event or want to throw party w/ science at its core



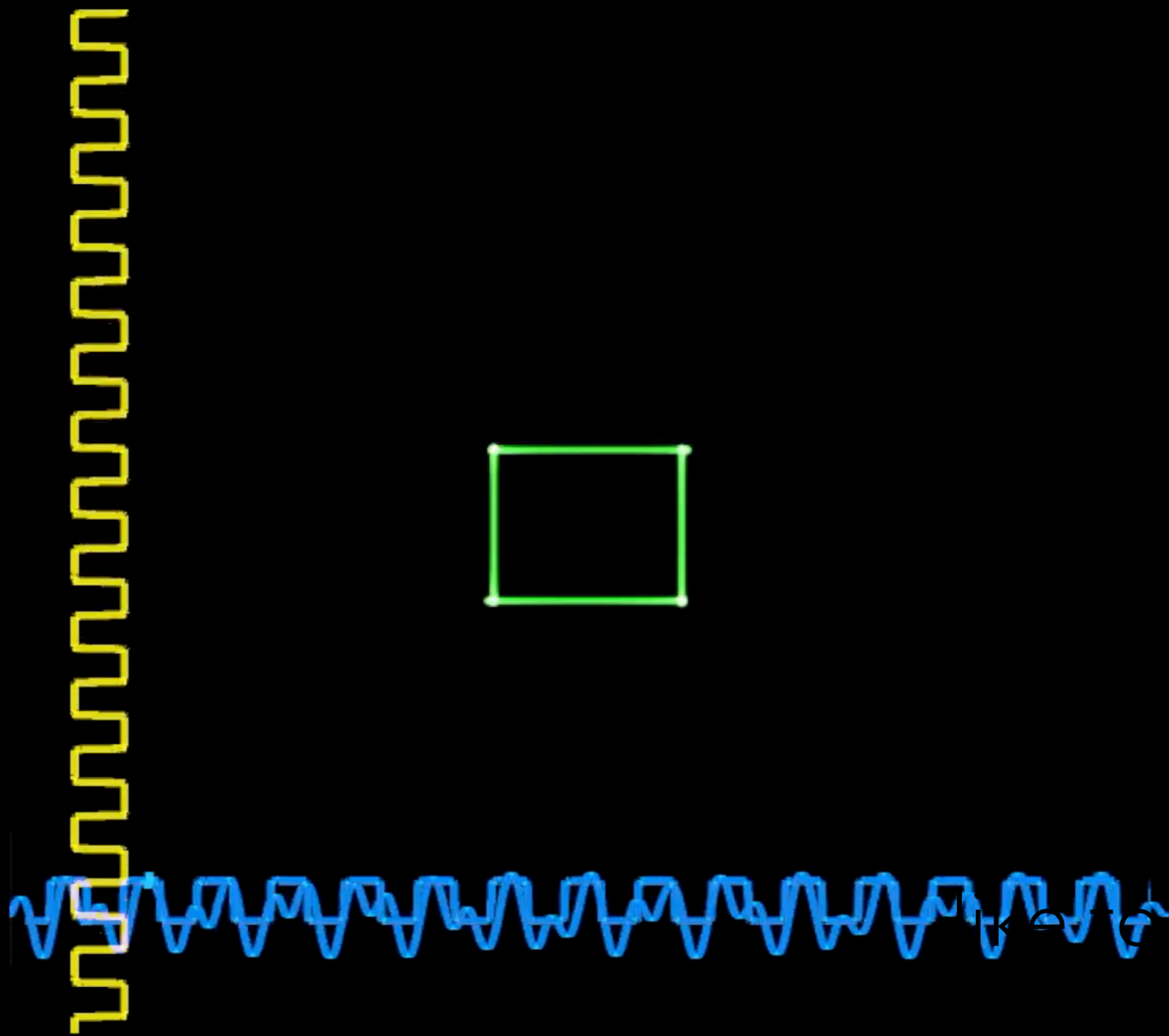
I "opened for" the Roots!

Thanks for your attention!









# I made heavy use of:

Blender

OsciStudio

Ableton Live

Oscilloscope!

PrettyScope

Max

TouchDesigner