

Introduction

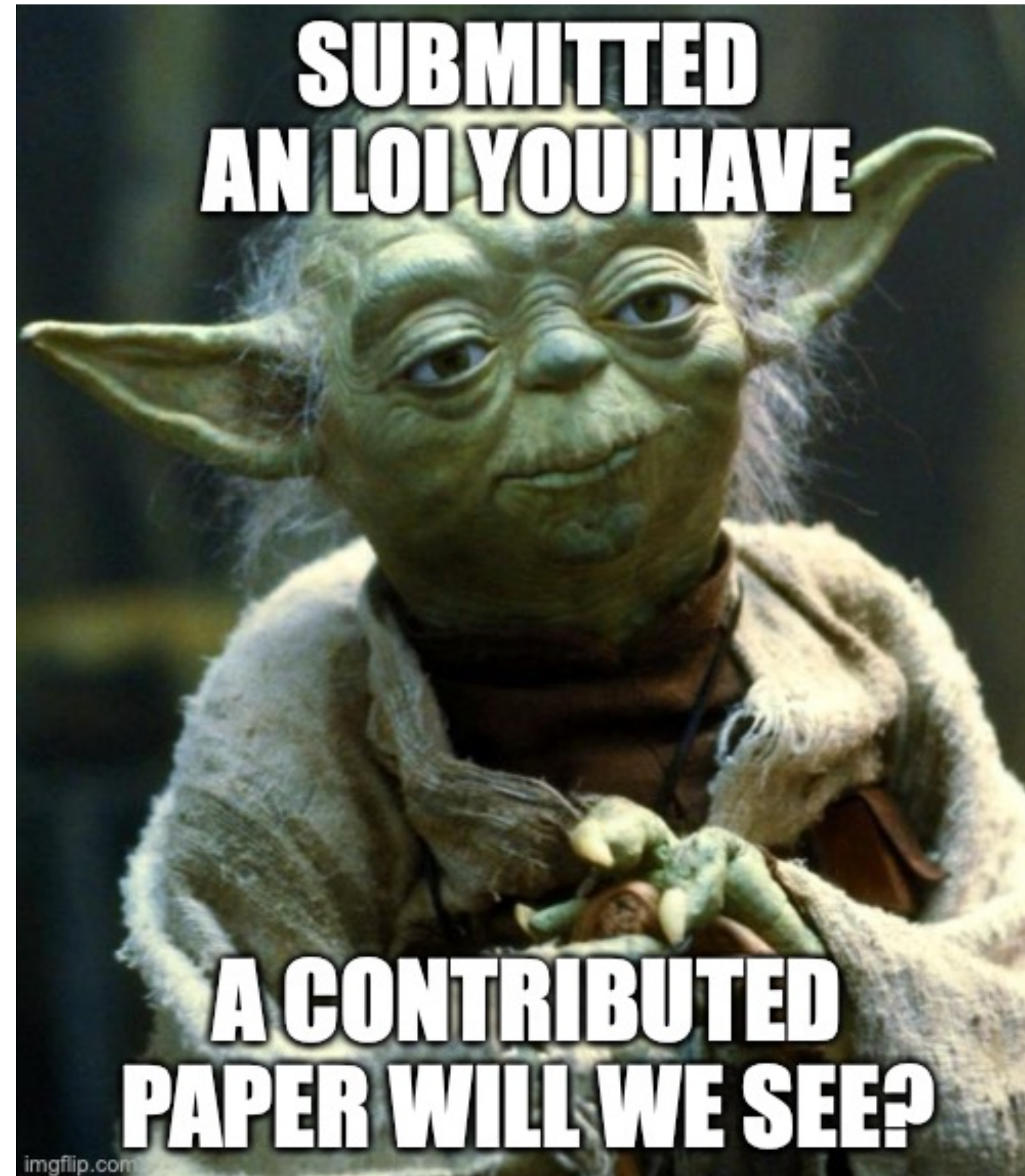
Patrick Meade Isobel Ojalvo

September 3rd, 2020

Miscellaneous

- Thank you for submitting all of your LOIs!
 - 1573 LOIs as of Monday - 178 EF LOI (makes sense as 1 of 10 frontiers)
- EF2 according to EF conveners had 28 LOIs (so we're well represented as 1 of 10 topical groups)
- In the process of reviewing the EF02 ones (all are public so feel free to peruse)
- If you didn't submit an LOI you still can, or just let us know what you're thinking about so we can make sure to include it in the general planning

After all...



New Meeting Time

Every other Thursday 10 am - 12 pm East Coast Time Starting (October 1st)

EF1 will hold their meetings at the *same time* on alternate weeks starting 9/24

This should allow for easier joint meetings

NEXT meeting (joint EF1/EF2) Tuesday 9/15 1 pm EDT

Please submit HH benchmarks to Sally and Patrick

Last but not least, don't forget the Community Planning Meeting: October 5-8

Today's Meeting - Flavor the continuation

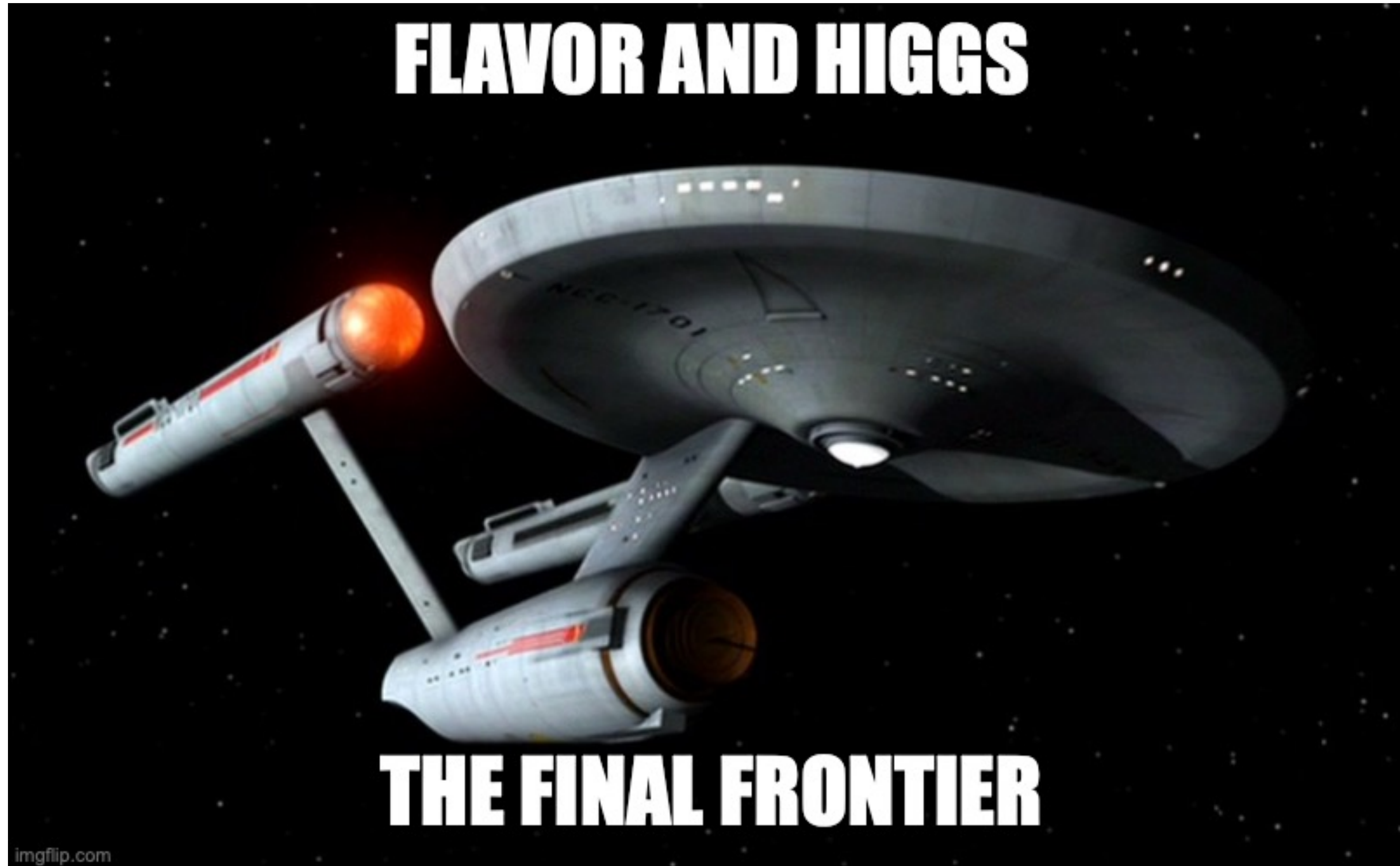


Last time - Focused on Theory

Focused on quark flavor with talks by: Ramona Gröber, Sam Homiller and Douglas Tuckler

Also had a talk about strange tagging by Yuichiro Nakai

Quick Recap...



FLAVOR AND HIGGS

THE FINAL FRONTIER

These are the voyages of the operators

$$y_{ij} \bar{Q}_i h u_j + c_{ij} \frac{h^\dagger h}{\Lambda^2} \bar{Q}_i h u_j$$

When SM contribution is small, a higher-dimension operator can make a big difference

In particular there can also be new contribution to di-Higgs production for example,
or other interesting consequences like a shift in the effective Yukawas for Higgs decays

Why aren't experimentalists always doing this and e.g. looking for flavor deviations in light generations?

FLAVOR BOUNDS



**However all flavor deviations
inherently are BSM -
so it all depends on the UV completion**



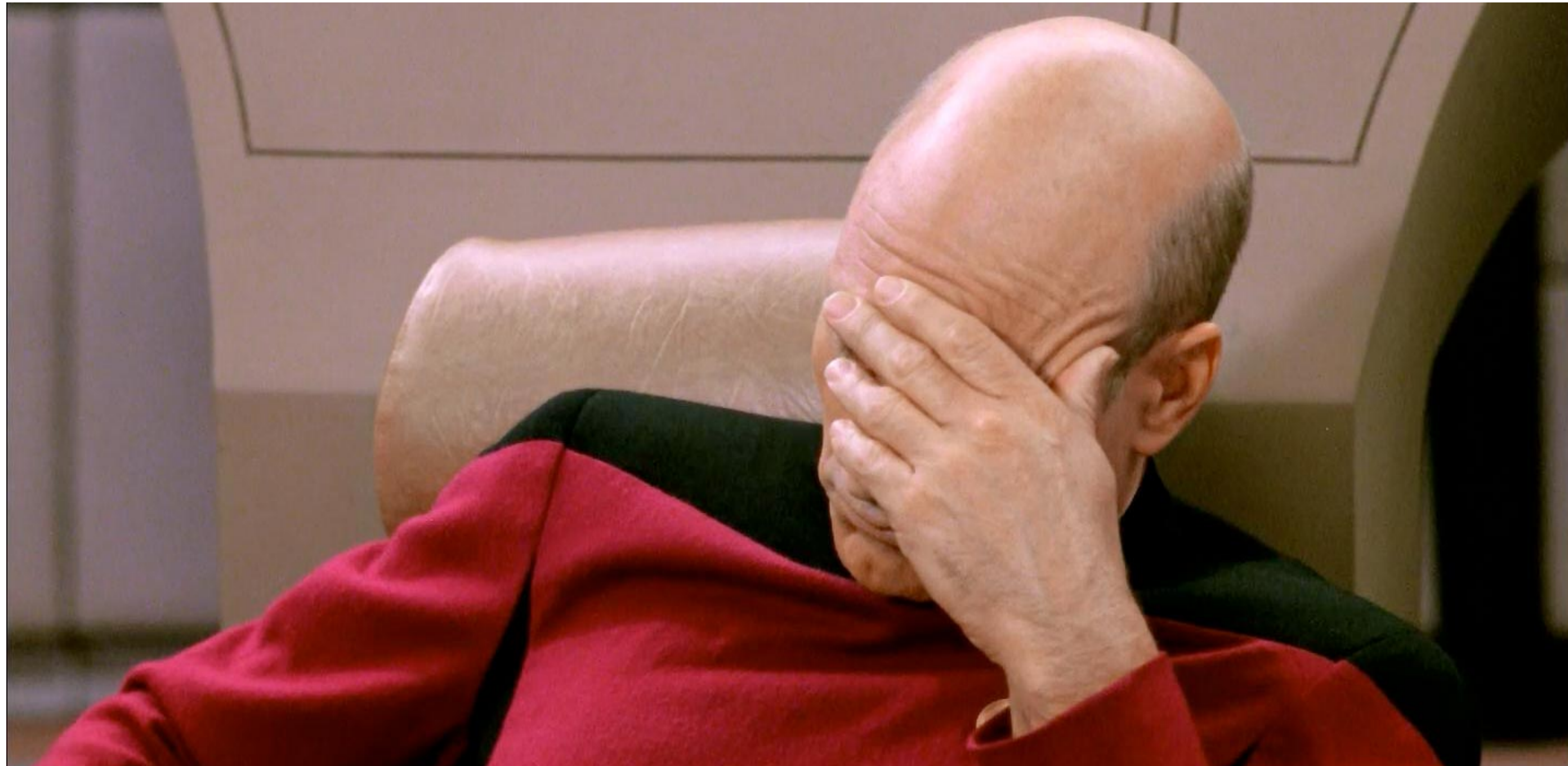
so you are telling me there is
a chanceYEA!

So we heard examples of UV completions with flavor deviations

All were examples using 2HDMs

NB for experimentalists:

THERE ARE NOT 4 TYPES OF 2HDM



This comes from a **sufficient,**
but **not necessary** **flavor** condition (NFC)

We heard about 2 ways out

- **Allowing FOR FCNCs but just at an experimentally allowed level (Flavorful 2HDMs)**
- **GIGANTIC flavor diagonal changes in Higgs sector protected by symmetry (Spontaneous Flavor Violation)**

Today

We'll hear another example today about how flavor can play an important role for BSM Higgs

The rest of the focus will be on flavor tagging methods like the strange-tagger talk we heard last time

Hopefully, an outcome of Snowmass when so much focus is on the Higgs is to realize how important it is to measure its flavor properties and figure out how to do it!

**And it wouldn't be an EF2 talk
without our canonical meme**

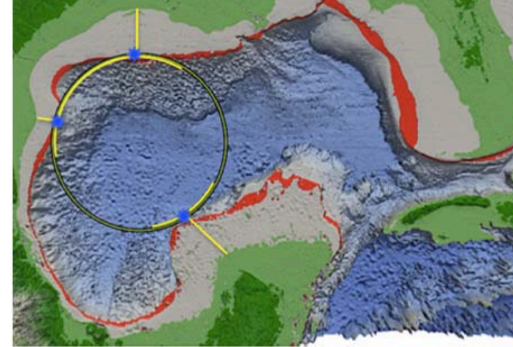


Figure 2: Bathymetry of the Gulf of Mexico, showing potential alignment of a 1,900 km circumference hadron

Collider in the Sea: Vision for a 500 TeV World Laboratory



Physics
Potential

μ -collider e w/PWFA 30 TeV

FCC-hh/SPPC

μ -collider 14 TeV

CLIC

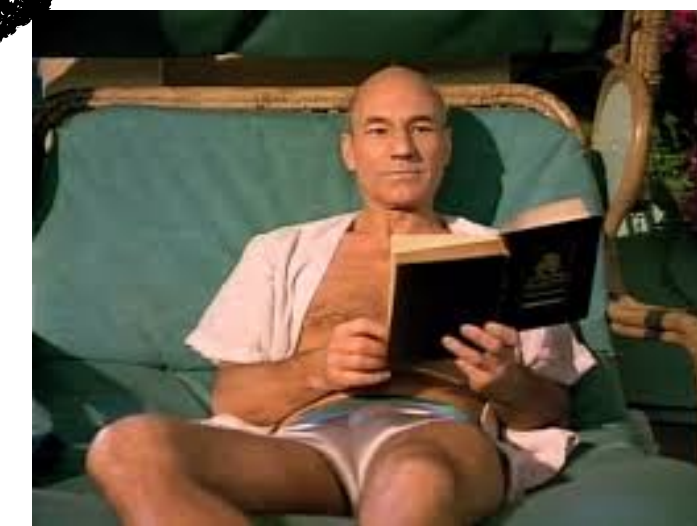
FCC-ee/CEPC

ILC

μ -collider 125



R&D attractiveness



**To determine physics
potential we need goals**

Observable/ Physics Driver/ Complementary Frontier Experiments	Scale or Precision Needed
EW Phase Transition	$\delta\lambda_3 \ll 1\%$
Higgs and Flavor	$\delta(y_u, y_d, y_s, y_e) \lesssim \mathcal{O}(1)$
Compositeness- Mesotuning	KK scale 10-100 TeV
Supersymmetry/Dark Matter- Mini Split SUSY	Nail the simplest WIMP 3 TeV Wino WIMP DM Mini-split implies 30 TeV gluino
Neutral Naturalness	Probe SM charged partner states at 20 TeV (naively implying 300 TeV pp collider)
Gravitational Waves/Phase Transitions	1-10 PeV LIGO 100 GeV-TeV LISA
Electron EDM rapid improvement 2-3 orders of mag in next decade or so	1 PeV - electron flavored 50 TeV - Higgs or EW Barr-Zee
Charged Lepton Flavor Violation 4 orders of mag in μ to e by 2035	50 TeV 1 loop CLVF

Now an LOI

Energy Frontier BSM Wishlist

Nima Arkani-Hamed¹, Tim Cohen², Nathaniel Craig³, JiJi Fan⁴, Zhen Liu⁵, Patrick Meade⁶, Isobel Ojalvo⁷, Matthew Reece⁸, Raman Sundrum⁵, Chris Tully⁷, and Lian-Tao Wang⁹

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"ALLEGEDLY."

DESUS & MERO SHOWTIME