Conduct @ Snowmass Community Summer Study

By participating in this workshop, you are consenting to abide by the DPF Core Principles & Community Guidelines (see https://snowmass21.org/cpcg/start).

- **Respect and support community members.**
  - Use privileged status to empower & amplify voices that are being excluded.

- **Communicate with empathy.**
  - Try to understand others’ ideas and perspectives before addressing them.

- **Commit to constructive dialogue.**
  - Criticize ideas, not people. Provide reasoned arguments that improve conversation.

- **Take initiative.**
  - Intervene when you see behavior that violates community standards.

Violations of community guidelines can be reported to the Ethics Advisory Committee’s Code-of-Conduct Response Team via email (snowmass-code@u.washington.edu) or Slack (#code-of-conduct) message, over Zoom, or in person.

- The CRT will treat all reporters respectfully and all complaints seriously.
- Behavior requiring an *immediate response* should also be reported to the session chair, Slack moderator, or similar authority.

You are encouraged to invoke the CP&CG as needed to promote and maintain a welcoming, professional, and safe environment for all workshop participants!
Energy Frontier: BSM II
session intro

EF08: Jim Hirschauer (FNAL), Elliot Lipeles (UPenn), Nausheen Shah (Wayne State)
EF09: Tulika Bose (U Wisconsin-Madison), Simone Griso (LBL), Zhen Liu (Minnesota)
EF10: Caterina Doglioni (Lund), LianTao Wang (Chicago), Antonio Boveia (Ohio State)
Intro and layout of the BSM report

● Introduction has a brief summary of BSM motivations…
  ○ **Direct observations**: DM, Matter-Antimatter Asymmetry, Anomalies, Existence of gravity, Cosmological tensions
  ○ **Theoretical Motivations**: Naturalness, Flavor structure of SM, Lightness of neutrinos, Strong CP violation, Desire for grand unified theory
  ○ **Exploring the unknown**: Maintaining a wide open view

● Above motivations most relevant to Energy Frontier are then expanded in two sections:

**II. Experimental guidance & motivation**
A. Dark Matter
B. Anomalies in Indirect Measurements (g-2, $m_W$, etc)
C. General Exploration

**III. Theoretical guidance & motivation**
A. Naturalness
B. Higgs and Electroweak Symmetry Breaking
C. Composite Higgs and Extra Dimensions
D. Supersymmetry (SUSY)
Intro and layout of the BSM report (con’t)

- This is followed by a brief discussion of methods and collider scenarios
- And then sections discussing search targets / signatures and projections

V. Composite Higgs and Extra Dimensions
   A. Kaluza-Klein Excitations
   B. Composite Higgs

VI. Supersymmetry (SUSY)
   A. pMSSM Scans

VII. Leptoquarks

VIII. New Bosons and Heavy Resonances
   A. Z’ Bosons: the Standard Candle of BSM Physics
   B. W’ Bosons
   C. Axion-Like Particles
   D. Dijet Resonances

IX. New Fermions
   A. Neutral Leptons
   B. Charged Leptons
   C. Heavy Quarks
   D. Exotic Signals

X. Long Lived Particles
   A. Strategies and detector R&D
   B. Dedicated detectors for LLPs
   C. Signatures & models

XI. Dark Matter
   A. Testing the simplest/minimal WIMP models (EW multiplets) and their extensions
   B. Testing DM with the Higgs boson
   C. Dark Matter: Simplified models
   D. Beyond WIMPs: Dark Matter portals and other models

XII. Other signatures
   A. Charged-lepton flavor violation
   B. Anomaly detection
Goals for today:
● Discussion of the main messages pertaining to “More general explorations” or EF09
  ○ Sessions on Monday and Thursday focused on Higgs as a portal to new physics (EF02), Model specific explorations (EF08) and Dark Matter (EF10)
● Panel discussion related to the overall message of the EF BSM report
More general explorations (EF09)

Sections
● New Bosons and Heavy Resonances
● New Fermions
● Long-Lived Particles
● Other signatures (anomaly detection, extreme dark-sector motivated signatures, charged lepton flavor violation … not discussed in this presentation)

Main Goal:
● Provide standard-candle assessment of potential for high-energy exploration
● Emphasize and maximize flexibility of colliders in exploring unexpected signatures now and in the future
Schedule

8:00 AM | **Introduction**

Speaker: Simone Pagan Griso (Lawrence Berkeley National Laboratory), Tulika Bose (University of Wisconsin-Madison), Zhen Liu (University of Minnesota)

8:10 AM | **New Bosons and Heavy Resonances**

10' after the talk is reserved for Q&A

Speaker: Robert Harris (Fermilab)

8:35 AM | **New Fermions**

10' after the talk is reserved for Q&A

Speaker: Julie Hogan (Bethel University)

9:00 AM | **LLPs: overview of main results in the report**

Speaker: Juliette Alimena (CERN)

9:10 AM | **LLPs: interplay with instrumentation frontier**

Speaker: Artur Apresyan (Fermilab)

9:25 AM | **LLPs: common discussion**

9:35 AM | **Panel: strengthen the main messages of the EF BSM report -- feedback from community**

Speakers: Dean Robinson (LBL), Stephane Willocq (University of Massachusetts), Suchita Kulkami, Tova Holmes (University of Tennessee)
### Relevant Sessions

<table>
<thead>
<tr>
<th>Day</th>
<th>EF Plenary Session</th>
<th>Time</th>
<th>Room</th>
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</thead>
<tbody>
<tr>
<td>Thur, 7-21</td>
<td>EF DM Discussion</td>
<td>10am-12pm</td>
<td>110 Kane</td>
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<tr>
<td>Fri, 7-22</td>
<td>EF BSM IV</td>
<td>8am-9am</td>
<td>102 JHN</td>
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<tr>
<td>Fri, 7-22</td>
<td>EF BSM V</td>
<td>9am-10am</td>
<td>022 JHN</td>
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<tr>
<td>Sat, 7-23</td>
<td>EF Discussion and Summaries (ie EF plenary)</td>
<td>8am-noon</td>
<td>130 Kane</td>
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<tr>
<td>Tue, 7-19</td>
<td>Lepton Colliders</td>
<td>3:30pm-5:00pm</td>
<td>120 Kane</td>
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<tr>
<td>Sat, 7-23</td>
<td>Physics on the Energy Frontier</td>
<td>2pm-3:30pm</td>
<td>130 Kane</td>
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<tr>
<td>Mon, 7-25</td>
<td>Panel: Physics Highlights from the Frontiers</td>
<td>8:00-9:30am</td>
<td>130 Kane</td>
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<tr>
<td>Tue, 7-26</td>
<td>Panel: Large Exp./Facilities &amp; timelines</td>
<td>9:00-10:00am</td>
<td>130 Kane</td>
</tr>
<tr>
<td>Tue, 7-26</td>
<td>Panel: Mid/Small Exp./Facilities &amp; timelines</td>
<td>10:30-11:30am</td>
<td>130 Kane</td>
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## (selected) Relevant Sessions

<table>
<thead>
<tr>
<th>Date</th>
<th>Session Name</th>
<th>Time Slot in PS</th>
<th>Room loc</th>
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<tbody>
<tr>
<td>Monday</td>
<td>EF Higgs and BSM I</td>
<td>8am-noon</td>
<td>332 HUB</td>
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<td></td>
<td>XF: Report of the Accelerator Frontier Implementations</td>
<td>3:35pm-5pm</td>
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<td>Tuesday</td>
<td>XF DM Complementarity</td>
<td>8am-noon</td>
<td>220 Kane</td>
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<td>XF Energy Frontier Theory</td>
<td>8am-noon</td>
<td>175 JHN</td>
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<td></td>
<td>EF Plenary - Lepton Colliders</td>
<td>3:35pm-4:58pm</td>
<td>120 Kane</td>
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<tr>
<td>Wednesday</td>
<td>EF BSM II - non DM</td>
<td>8am-10am</td>
<td>220 Kane</td>
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<tr>
<td></td>
<td>XF Long Lived Particles</td>
<td>10am-noon</td>
<td>340 HUB</td>
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<tr>
<td>Thursday</td>
<td>EF DM Discussion</td>
<td>10am-12pm</td>
<td>110 Kane</td>
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<td>XF Flavor anomalies and exotics at colliders</td>
<td>8am-10am</td>
<td>241 Kane</td>
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<td>XF CLFV and heavy states</td>
<td>10am-12pm</td>
<td>231 MGH</td>
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<td></td>
<td>XF Flavor anomalies &amp; exotics (RF-EF-TF)</td>
<td>10am-12pm</td>
<td>241 MGH</td>
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<td>Friday</td>
<td>EF BSM IV</td>
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<td></td>
<td>NF-EF Cross-cutting issues</td>
<td>8am-10am</td>
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<td></td>
<td>combined EF/AF report discussion</td>
<td>10am-12pm</td>
<td>022 JHN</td>
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<tr>
<td>Saturday</td>
<td>EF Discussion and Summaries (i.e. EF plenary)</td>
<td>8am-noon</td>
<td>130 Kane</td>
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<tr>
<td></td>
<td>EF Plenary talks - Physics on the Energy Front</td>
<td>2pm-3:30pm</td>
<td>130 Kane</td>
</tr>
<tr>
<td>Sunday</td>
<td>XF: AF Future Colliders R&amp;D Program Initiative</td>
<td>10am-noon</td>
<td>120 Kane</td>
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<td>Monday</td>
<td>Panel: Physics Highlights from the Frontiers</td>
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Broad BSM search (model agnostic searches) complementary and important
Questions to our panelists

- What is the main takeaway message from the BSM report that should be conveyed in the overall Energy Frontier executive summary?
- What important physics point do you see missing in the EF BSM report or not emphasized enough?
- How important do you consider model independent (model agnostic, anomaly detection etc.) searches to be?