

Precision Hadronic Measurements at the LHC with Energy Correlators

Zhen Xu

DESY

Sep 29, 2026 QCD@LHC, Oxford

Outline

Energy energy correlator and generalizations

- ▷ factorization of energy correlators in different kinematic limits
- ▷ feasibility of top mass measurement from EEEEC in boosted top decay

$$Z \rightarrow b\bar{b} \quad [\text{Jonathan Kley, Aditya Pathak, Francesco Riva, ZX, in progress}]$$

- ▷ boost kernel for EEC with polarization
- ▷ mass effect and b -quark mass extraction

$$\bar{B} \rightarrow X_s \gamma \quad [\text{Philipp Boër, Aditya Pathak, ZX, in progress}]$$

- ▷ factorization with SCET_I, SCET_{II} and SCET₊
- ▷ joint resummation of energy correlation and jettiness

$$t \rightarrow Wb \rightarrow q\bar{q}'b \quad [\text{progress and outlook}]$$

- ▷ factorization structure in boosted HQET
- ▷ the non-trivial soft function

Energy-energy correlator

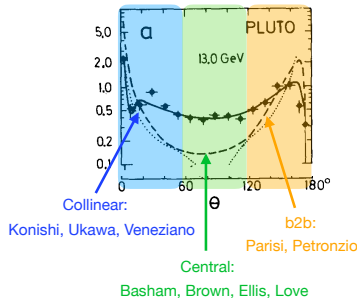
The energy-energy correlator in terms of $z = (1 - \cos \theta_{ij})/2$,

[Basham, Brown, Ellis, Love, PRL. 41 (1978) 1585 & PRD. 19 (1979) 2018]

$$\text{EEC}(z) \equiv \frac{1}{\sigma_0} \frac{d\sigma}{dz} = \sum_{i,j} \int d\sigma \frac{E_i E_j}{Q^2} \delta \left(z - \frac{1 - \cos \theta_{ij}}{2} \right)$$

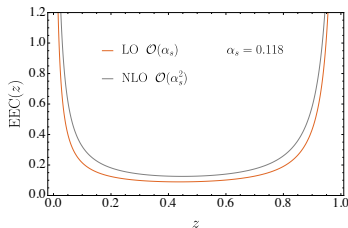
Experimental measurement from PLUTO:

[PLUTO Collaboration, Z. Phys. C 28 (1985) 365]



First event-shape calculated analytically at NLO, using IBP with reverse unitarity

[Dixon, Luo, Shtabovenko, Yang, Zhu, PRL. 120 (2018) 102001]



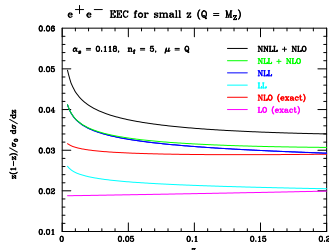
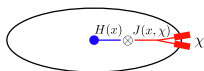
Large logarithms in collinear limit $\left[\frac{\ln^{k-1} z}{z} \right]_+$ and back-to-back limit $\left[\frac{\ln^{2k-1}(1-z)}{1-z} \right]_+$

Factorization of energy correlators in SCET

Collinear limit of energy-energy correlator $z = (1 - \cos \chi_{ij})/2 \rightarrow 0$:

[Dixon, Moulst, Zhu, arXiv:1905.01310]

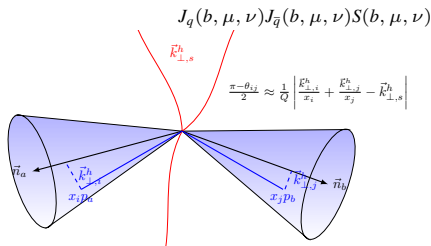
$$\Sigma(z) = \int_0^1 dx x^2 \vec{H}(x) \cdot \vec{J} \left(\ln \frac{zx^2 Q^2}{\mu^2} \right)$$



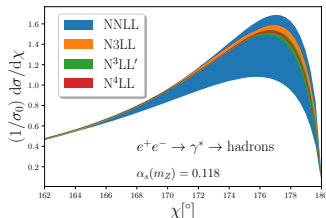
Factorization in back-to-back limit $\sqrt{1-z} \ll 1$ in the massless case:

[Moulst, Zhu, arXiv:1801.02627]

$$\frac{d\sigma}{dz} = \frac{1}{2} \int_0^\infty \frac{b db}{2} J_0(bQ\sqrt{1-z}) H(Q, \mu)$$



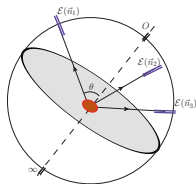
[Duhr, Mistlberger, Vita, arXiv:2205.02242]



Multi-point energy correlators

Three-point energy correlator (EEEC), characterize events with three-prong structure

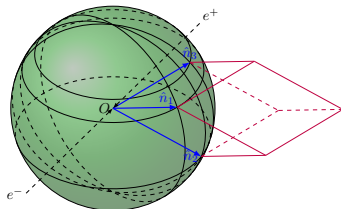
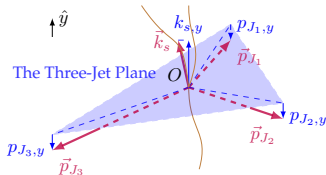
$$\frac{1}{\sigma_{\text{tot}}} \frac{d^3\sigma}{dx_1 dx_2 dx_3} = \sum_{ijk} \int d\sigma \frac{E_i E_j E_k}{Q^3} \delta\left(x_1 - \frac{1 - \cos\theta_{jk}}{2}\right) \times \delta\left(x_2 - \frac{1 - \cos\theta_{ik}}{2}\right) \delta\left(x_3 - \frac{1 - \cos\theta_{ij}}{2}\right)$$



Co-planar limit of three-point energy correlator $\tau_p = |(\hat{n}_1 \times \hat{n}_2) \cdot \hat{n}_3| \rightarrow 0$

[Gao, Yang, Zhang, arXiv:2411.09428]

$$\frac{1}{\sigma_{\text{LO}}} \frac{d\sigma_q}{d\tau_p} = \int_T dv dw H_q(v, w, \mu) \int_{-\infty}^{\infty} \frac{db_y}{2\pi\xi} 2 \cos\left(\frac{b_y \tau_p}{\xi}\right) \times S(b_y, \mu, \nu) J_q(b_y, \mu, \nu) J_{\bar{q}}(b_y, \mu, \nu) J_g(b_y, \mu, \nu)$$

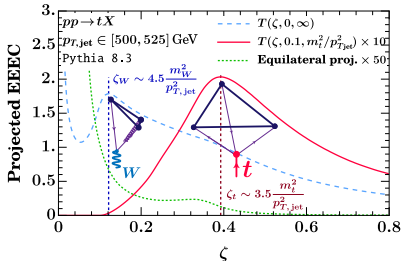


the same Sudakov structure will help us to identify the mass scale

Feasibility of top quark mass measurement from energy correlators

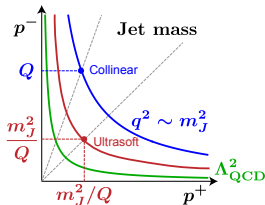
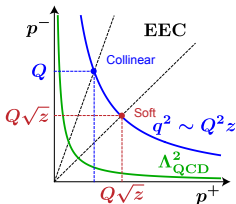
Top quark mass measurement from energy correlators.

[Holguin, Moul, Pathak, Procura, Schöfbeck, Schwarz, arXiv:2311.02157, PRL134 (2025) 23]



$$m_t = m_W \left[C(\alpha_s, R) \sqrt{\zeta_t / \zeta_W} + \mathcal{O} \left(\frac{m_W}{p_{T,jet}}, \frac{m_t}{p_{T,jet}} \right) \right]$$

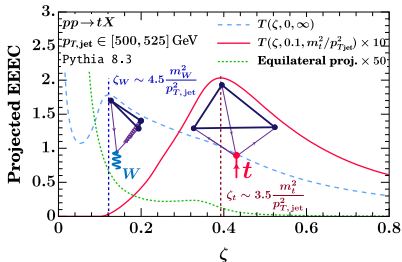
- ▷ Peak positions sensitive to mass values, calibrate m_t with m_W to reduce jet energy scale uncertainty
- ▷ EEC as SCET_{II} observable has smaller sensitivity to hadronization



Feasibility of top quark mass measurement from energy correlators

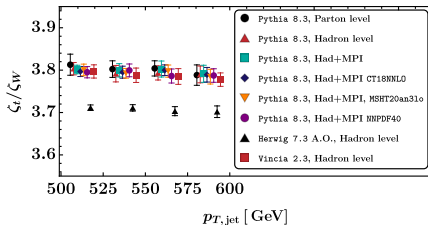
Top quark mass measurement from energy correlators.

[Holguin, Moul, Pathak, Procura, Schöfbeck, Schwarz, arXiv:2311.02157, PRL134 (2025) 23]



$$m_t = m_W \left[C(\alpha_s, R) \sqrt{\zeta_t / \zeta_W} + \mathcal{O} \left(\frac{m_W}{p_{T,\text{jet}}}, \frac{m_t}{p_{T,\text{jet}}} \right) \right]$$

- ▷ Peak positions sensitive to mass values, calibrate m_t with m_W to reduce jet energy scale uncertainty
- ▷ Robustness tested against Monte-Carlo simulations, theory predictions in progress



Precise jet substructure from boosted event-shapes

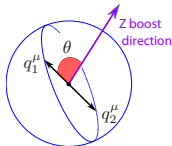
[Feige, Schwartz, Stewart, Thaler arXiv:1204.3898]

▷ N -jettiness event-shape [Stewart, Tackmann, Waalewijn, arXiv:1004.2489]

$$\mathcal{T}_N \equiv \min_{n_1, n_2, \dots, n_N} \sum_{j \in J} \min\{n_1 \cdot p_j, n_2 \cdot p_j, \dots, n_N \cdot p_j\}$$

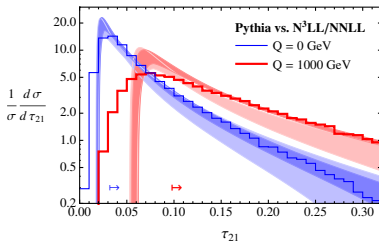
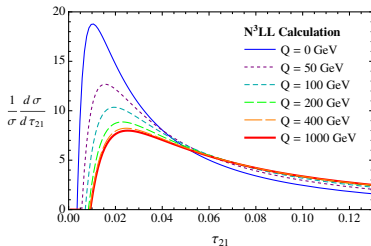
Two-jettiness measured in jets from boosted Z decay:

$$\frac{1}{\sigma_0} \frac{d\sigma}{d\tau_{21}} = H \int \frac{d\cos\theta}{2} \int ds_1 ds_2 dk_1 dk_2 S(k_1, k_2, \{n_i\}, \mu) \\ \times J(s_1, \mu) J(s_2, \mu) \delta\left(\tau_{21} - \frac{k_1 + k_2}{P_Z^+} - \frac{s_1 E_2 + s_2 E_1}{2E_1 E_2 P_Z^+}\right)$$



- ▶ Jet function universal under rescaling $n_1 \rightarrow \beta n_1$ and $n_2 \rightarrow \beta n_2$
- ▶ Soft function transforms as

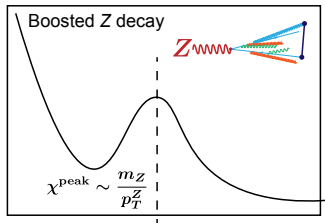
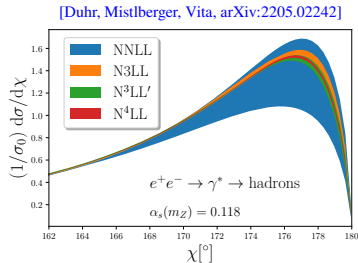
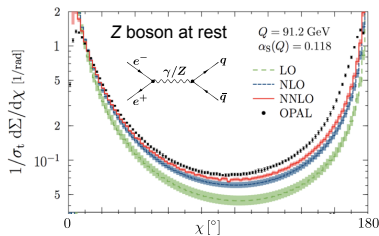
$$S(k_1, k_2, n_1 \cdot n_2, \mu, \Lambda) = \beta^2 S(\beta k_1, \beta k_2, \beta^2 n_1 \cdot n_2, \mu, \Lambda)$$



Energy correlators on boosted boson decays

[Holguin, Moulton, Pathak, Procura, Sule, arXiv: 2601.20923][Gao, Lee and Zhang, arXiv: 2601.20933]

Sudakov structure of EEC and the boost



- Sudakov peak location boosted to $z \simeq 1/\gamma^2 = m^2/Q^2$
- The whole spectrum in boosted kinematics from convoluting rest-frame result with boost kernel.

Boost kernel for energy correlators on scalar and vector bosons

[Holguin, Moulton, Pathak, Procura, Sule, arXiv: 2601.20923][Gao, Lee and Zhang, arXiv: 2601.20933]

EEC in boosted kinematics with operator definition:

$$\frac{d\sigma}{dz'} \equiv \frac{1}{Q^2} \int d^2\Omega_{\vec{n}'_1} d^2\Omega_{\vec{n}'_2} \delta\left(z' - \frac{\vec{n}'_1 \cdot \vec{n}'_2}{2}\right) \langle \Psi' | \mathcal{E}(\vec{n}'_1) \mathcal{E}(\vec{n}'_2) | \Psi' \rangle$$

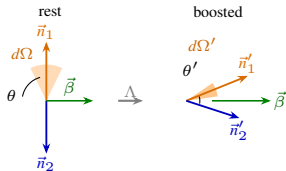
▷ The boost rescales each direction

$$\Lambda^\mu{}_\nu(\vec{\beta}) n^\nu = \lambda(\vec{n}) n'^\mu, \quad \lambda(\vec{n}) = \gamma(1 - \vec{\beta} \cdot \vec{n})$$

solid angle $d^2\Omega_{\vec{n}'} = \lambda^{-2} d^2\Omega_{\vec{n}}$

opening angle $z' = z/(\lambda_1 \lambda_2)$

energy flow $\langle \Psi' | \mathcal{E}(\vec{n}'_1) \mathcal{E}(\vec{n}'_2) | \Psi' \rangle = \lambda_1^3 \lambda_2^3 \langle \Psi | \mathcal{E}(\vec{n}_1) \mathcal{E}(\vec{n}_2) | \Psi \rangle$



▷ For an isotropic scalar decay, the boosted EEC is the average of z' over the boost direction

$$\frac{d\sigma}{dz'} = \int_0^1 dz \mathcal{K}_\gamma(z, z') \frac{d\sigma}{dz}, \quad \mathcal{K}_\gamma(z, z') = \frac{1}{\gamma^2} \int \frac{d^2\Omega}{4\pi} \frac{z}{z'} \delta\left(z' - \frac{z}{\lambda_1 \lambda_2}\right)$$

▷ The average evaluates to a complete elliptic integral K of the first kind

$$\mathcal{K}_\gamma(z, z') = \frac{z^{3/2} \Theta(m(z, z'))}{2\pi \gamma^2 \sqrt{\gamma^2 - 1} z'^{5/2} \sqrt[4]{(1-z)(1-z')}} \times \begin{cases} K(\sqrt{m(z, z')}), & 0 \leq m < 1 \\ m(z, z')^{-1/2} K(m(z, z')^{-1/2}), & m > 1 \end{cases}$$

Boost kernel for energy correlators on scalar and vector bosons

[Holguin, Moulton, Pathak, Procura, Sule, arXiv: 2601.20923][Gao, Lee and Zhang, arXiv: 2601.20933]

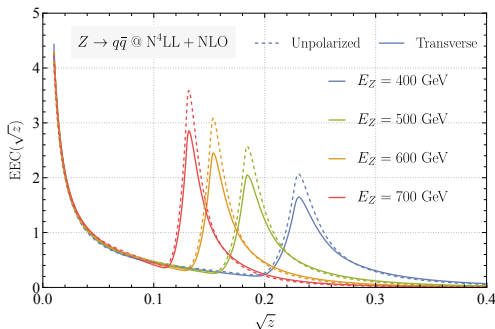
Vector boson decay is not isotropic due to polarization, for transverse Z production

$$\mathcal{K}_\gamma^V = \frac{3}{4} [\mathcal{K}_\gamma + \mathcal{K}_x^{(2)}], \quad \mathcal{K}_x^{(n)} = \frac{1}{\gamma^2} \int \frac{d^2\Omega}{4\pi} x^n \frac{z}{z'} \delta\left(z' - \frac{z}{\lambda_1 \lambda_2}\right)$$

▷ The orientation average picks up the polarization weight [\[credit to Anjie Gao\]](#)

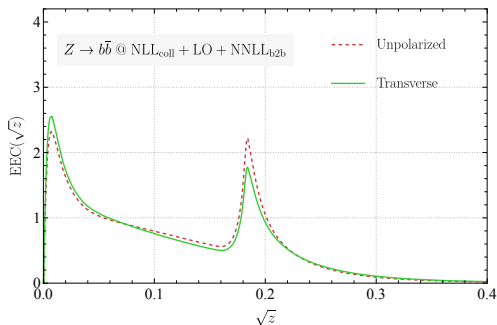
▷ $\mathcal{K}_x^{(2)}$ needs all three complete elliptic integrals

▷ The rescaling $z' = z/(\lambda_1 \lambda_2)$ does not change, Sudakov peak stays at $z' \simeq 1/\gamma^2$



Energy correlators with heavy-quark mass

Quark mass effect in EEC on boosted $Z \rightarrow b\bar{b}$:



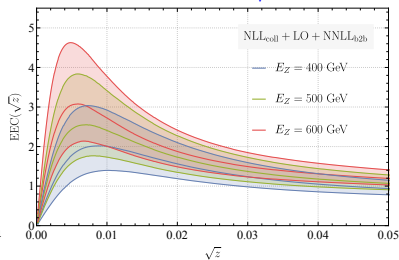
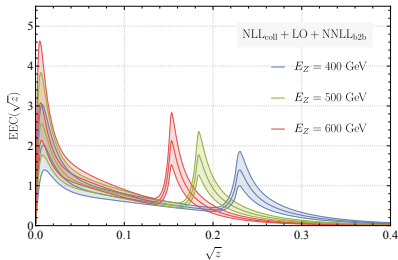
- ▷ Presence of dead-cone peak due to suppression of collinear emission of heavy quark
- ▷ Sudakov structure determined by the mass of decaying Z

Test example for calibration of the quark mass extraction with the peak ratio

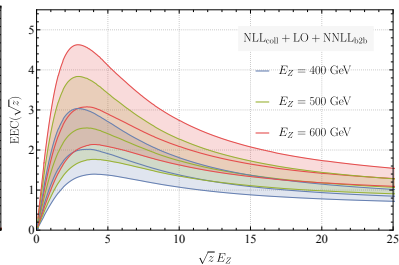
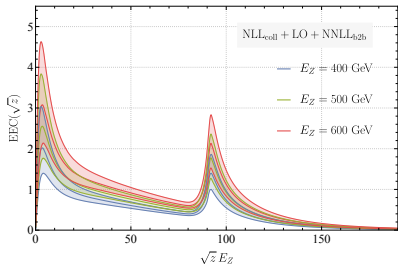
- ▷ Theory prediction available in this case at $\text{NLL}_{\text{coll}} + \text{NNLL}_{b2b}$
- ▷ The whole EEC distribution can be boosted
- ▷ Background from light-quarks understood to high perturbative accuracy

EEC in boosted kinematics

Reminder: in the collinear limit $\sqrt{z} = \sqrt{\frac{1-\cos(\chi)}{2}} \sim \chi/2$



Sudakov feature formed by hard $b\bar{b}$ pair is boosted into the same large-radius jet.

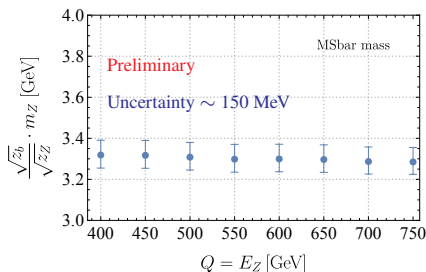


Plotting in terms of $\sqrt{z} E_Z$ characterize the correct mass scales from the peak positions.

b quark mass from peak position ratio

PDG: b -quark mass measurements

Peak position ratio from theory prediction



[Jet-substructure measurement]
[applicable at the LHC]

World average: 4.186 ± 0.006 GeV

Measurements at hadron collider:

$3.94^{+0.46}_{-0.40}$ GeV [Aparisi et al (2022)]

4.205 ± 0.058 GeV [Boughezal et al (2006)]

b

$$I(J^P) = 0(1/2^+)$$

Charge = $-\frac{1}{3} e$ Bottom = -1

b -QUARK MASS

[1] 4.1859 $\pm$ 0.0034 GeV

b -quark mass corresponds to the "running mass" $\bar{m}_b(\mu = \bar{m}_b)$ in the $\overline{\text{MS}}$ scheme. We have converted masses in other schemes to the $\overline{\text{MS}}$ mass using two-loop QCD perturbation theory with $\alpha_s(\mu = \bar{m}_b) = 0.223 \pm 0.008$. The value 4.186 ± 0.006 (GeV) for the $\overline{\text{MS}}$ mass corresponds to 4.788 ± 0.016 GeV for the pole mass, using the two-loop conversion formula. A discussion of masses in different schemes can be found in the "Note on Quark Masses."

$\overline{\text{MS}}$ MASS (GeV)

DOCUMENT ID

TEC

4.186 $\pm$ 0.006 (CL = 90%)

OUR EVALUATION See the ideogram below.

4.1923 $\pm$ 0.0063

¹ COLQUHOUN 2026

CL LATT

3.94 $^{+0.46}_{-0.40}$

² APARISI 2022

CL THEO

4.202 $\pm$ 0.021

³ HATTON 2021

CL LATT

4.197 $\pm$ 0.008

⁴ NARISON 2020

CL THEO

4.040 $^{+0.128}_{-0.119}$

⁵ ABRIAMOWICZ 2018

CL HERA

4.195 $\pm$ 0.014

⁶ BAZANOV 2018

CL LATT

4.186 $\pm$ 0.037

⁷ PESET 2018

CL THEO

4.197 $\pm$ 0.022

⁸ KIYO 2016

CL THEO

4.183 $\pm$ 0.037

⁹ ALBERTI 2015

CL THEO

4.203 $^{+0.014}_{-0.014}$

¹⁰ BENEKE 2015

CL THEO

4.196 $\pm$ 0.023

¹¹ COLQUHOUN 2015

CL LATT

4.176 $\pm$ 0.023

¹² DEHNADI 2015

CL THEO

4.21 $\pm$ 0.11

¹³ BERNARDINI 2014

CL LATT

4.169 $\pm$ 0.002 $\pm$ 0.008

¹⁴ PENIN 2014

CL THEO

4.166 $\pm$ 0.043

¹⁵ LEE 2013O

CL LATT

4.247 $\pm$ 0.034

¹⁶ LUCHA 2013

CL THEO

4.171 $\pm$ 0.069

¹⁷ BODENSTEIN 2012

CL THEO

4.29 $\pm$ 0.14

¹⁸ DIMOPOULOS 2012

CL LATT

4.18 $^{+0.06}_{-0.04}$

¹⁹ LASCHKA 2011

CL THEO

4.186 $\pm$ 0.044 $\pm$ 0.015

²⁰ ALBERTI 2010A

CL BABR

4.163 $\pm$ 0.016

²¹ CHETYRKIN 2009

CL THEO

4.243 $\pm$ 0.049

²² SCHWANDA 2008

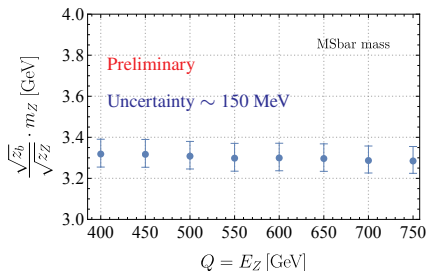
CL BELL

The boost kernel is not homogeneous between the collinear and the back-to-back limits,

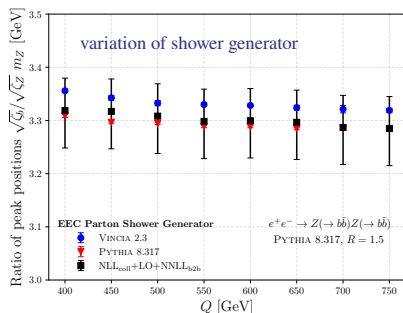
$$m_b = C \frac{\sqrt{z_b}}{\sqrt{z_Z}} m_Z \text{ with } C \text{ determined from the boost kernel.}$$

b quark mass from peak position ratio

Peak position ratio from theory prediction



Comparison with Monte-Carlo simulation



Monte-Carlo simulation for quantifying the systematics

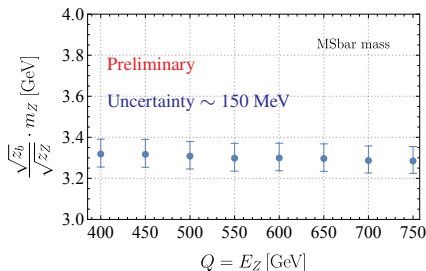
Realistic extraction would use

- ▷ perturbative calculation augmented by resummation
- ▷ non-perturbative input from universal matrix-element Ω_1 and Collins-Soper kernel

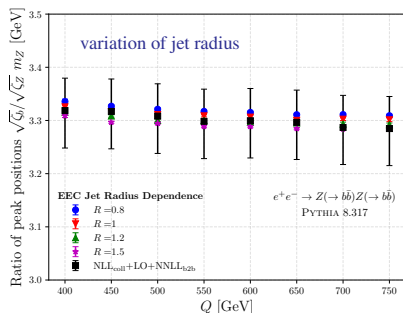
Strategy applicable for $H \rightarrow b\bar{b}$ with reduced light-quark background

b quark mass from peak position ratio

Peak position ratio from theory prediction



Comparison with Monte-Carlo simulation



Monte-Carlo simulation for quantifying the systematics

Realistic extraction would use

▷ perturbative calculation augmented by resummation

▷ non-perturbative input from universal matrix-element Ω_1 and Collins-Soper kernel

Strategy applicable for $H \rightarrow b\bar{b}$ with reduced light-quark background

From boosted vector boson to boosted top decays

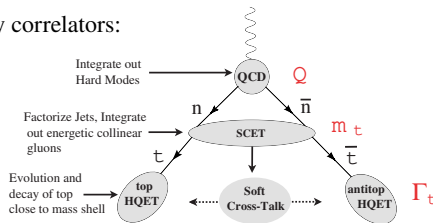
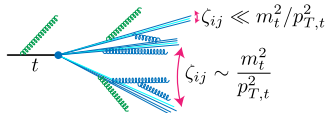
Summary from energy correlators on heavy vector boson:

- ▷ Boost properties for EEC measurement better understood
- ▷ Identification of mass scales from the Sudakov structure

Towards top-mass measurement from energy correlators:

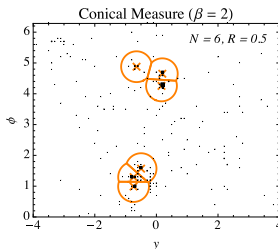
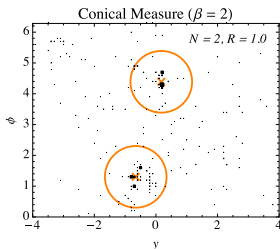
- ▷ Colored unstable particle, with boosted HQET

[Fleming, Hoang, Mantry, Stewart, arXiv:hep-ph/0703207]



- ▷ Exclusive top-quark jet measurements, identifying fat jets with N -jettiness resolution

[Stewart, Tackmann, Thaler, Vermilion, Wilkason, arXiv:1508.01516]



A perfect case study that inherits both of these features: energy flow in $\bar{B} \rightarrow X_s \gamma$

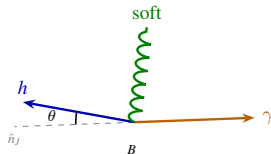
Joint resummation of energy flow and jettiness in $\bar{B} \rightarrow X_s \gamma$

Photon spectrum as $E_\gamma \rightarrow m_B/2$ factorizes into a perturbative jet function with the B -meson shape function [Ligeti, Stewart, Tackmann, arXiv:0807.1926; more]

$$\frac{d\Gamma}{dE_\gamma} = 2\Gamma_0 \left(\frac{2E_\gamma}{m_b} \right)^3 \int dk \mathcal{P}(k) S_B(m_B - 2E_\gamma - k) + \mathcal{O}\left(\frac{\Lambda_{\text{QCD}}}{m_b}\right)$$

Integration over the double-differential distribution

$$\frac{d\Gamma}{dE_\gamma} = \int_0^1 dz \frac{d^2\Gamma}{dE_\gamma dz}, \quad z = \frac{1 - \hat{n}_\gamma \cdot \hat{n}_J}{2}$$



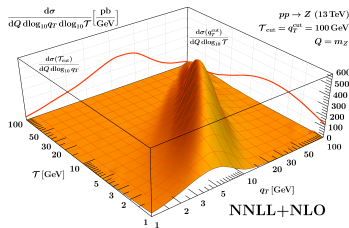
Joint measurement of E_γ spectrum and the energy correlation, over the full hierarchy [Philipp Böer, Aditya Pathak, ZX, in progress]

▷ One-jettiness: the photon-energy deficit

$$\mathcal{T} \equiv q_r^+ = q^+ - \omega_\gamma \sim m_B - 2E_\gamma$$

▷ Angular scale, fixed by q_T in the back-to-back limit

$$q_T \equiv |\mathbf{q}_\perp|, \quad \bar{z}_{12} \approx 1 - \frac{q_T^2}{m_b^2}$$

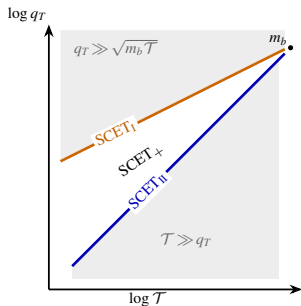


Final-state HQET analogue of joint $(q_T, \mathcal{T}_0)$ resummation

[Procura, Waalewijn, Zeune, arXiv:1410.6483]

[Lustermans, Michel, Tackmann, Waalewijn, arXiv:1901.03331]

Effective theory for the joint-resummation in $(q_T, \mathcal{T})$



▷ SCET_I: $\mathcal{T} \ll q_T \sim \sqrt{m_b \mathcal{T}}$ [See also: Zhao, arXiv:2607.27367]

Collinear radiation fixes q_T . The jet stays perturbative down to $\mathcal{T} \sim \Lambda_{\text{QCD}}$.

$$\int dk^+ \mathcal{J}_{\mathcal{E}}(k^+, q_T) S_b(\mathcal{T} - k^+)$$

▷ SCET_{II}: $\mathcal{T} \sim q_T \ll \sqrt{m_b \mathcal{T}}$

$$\int d^2 b_{\perp} e^{i b_{\perp} \cdot q_T} D(b_{\perp}) \mathcal{S}_b(\mathcal{T}, b_{\perp})$$

Double-differential soft function, perturbative for $q_T \sim \mathcal{T} \gg \Lambda_{\text{QCD}}$.

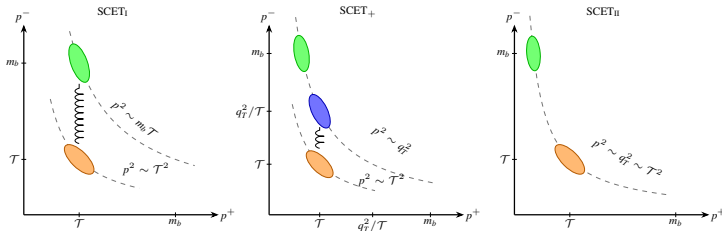
Two-dimensional shape-function at $q_T \sim \mathcal{T} \sim \Lambda_{\text{QCD}}$.

▷ SCET₊: $\mathcal{T} \ll q_T \ll \sqrt{m_b \mathcal{T}}$

Collinear-soft mode $(\mathcal{T}, q_T^2/\mathcal{T}, q_T)$ enters both measurements. OPE as

$$D(b_{\perp}) \otimes \mathcal{S}_{cs}(\mathcal{T}, b_{\perp}) \otimes S_b(\mathcal{T})$$

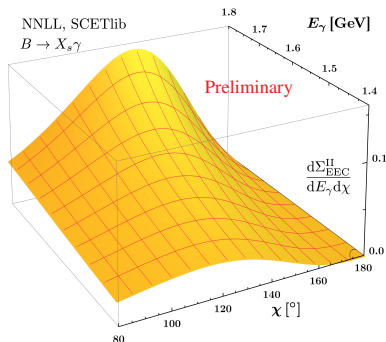
▷ Drell–Yan: $Q \sim m_Z$ with a wide SCET₊ window ▷ $\bar{B} \rightarrow X_s \gamma$: $Q \sim m_b$ SCET₊ region closes
SCET₊ still ensures SCET_I ↔ SCET_{II} consistency and guides the transition profile



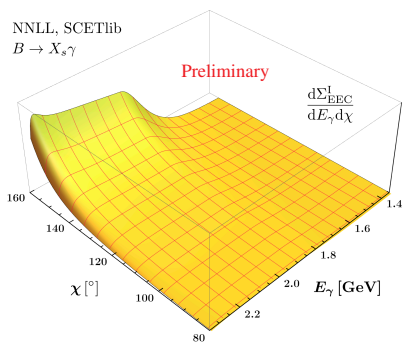
Resummation results for $\bar{B} \rightarrow X_s \gamma$

Computed and extracted all ingredients for the joint resummation at NNLL
RG consistency checked in both regions and for the re-factorization via SCET₊
Implemented in SCETlib: singular spectra in (χ, E_γ)

$$\text{SCET}_{\text{II}}: \mathcal{T} \sim q_T \ll \sqrt{m_b \mathcal{T}}$$



$$\text{SCET}_{\text{I}}: \mathcal{T} \ll q_T \sim \sqrt{m_b \mathcal{T}}$$



- ▷ Next: join resummed via profile functions, match to fixed order, fold with shape function
- ▷ The spectrum can be boosted to match the LHCb kinematics for boosted B mesons

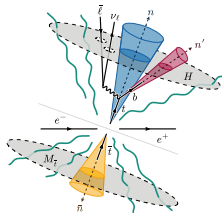
Outlook for EEEC on $t \rightarrow Wb \rightarrow q\bar{q}'b$

Factorization of the hemisphere jet mass in bHQET, in the peak region $M^2 - m^2 \ll m^2$
 [Fleming, Hoang, Mantry, Stewart, arXiv:hep-ph/0703207, arXiv:0711.2079; Bachu, Hoang, Mateu, Pathak, Stewart, arXiv:2012.12304]

$$\frac{d^2\sigma}{dM_t^2 dM_t^2} = H_Q(Q) H_m\left(m, \frac{Q}{m}\right) \int d\ell^+ d\ell^- B_+\left(\hat{s}_t - \frac{Q\ell^+}{m}, \Gamma_t\right) B_-\left(\hat{s}_t - \frac{Q\ell^-}{m}, \Gamma_t\right) S(\ell^+, \ell^-)$$

▷ the non-trivial soft function with resolved decay products. [Hoang, Regner, arXiv:2507.17872]

$$\begin{aligned} W^{\rho\mu} &= H_d^{\rho\mu} \int d\hat{\ell}^+ J_{n'}(\hat{H}^-(m_t \hat{v}^+ - \hat{q}^+ - \hat{\ell}^+)) \\ &\quad \times S_{\text{ucs}}(\hat{v}^+, v^-, \gamma^2, s^+, s^-, \hat{\ell}^+) \\ \tilde{S}_{\text{ucs}}^{\text{tree}} &= \frac{1}{\pi m_t} \frac{\delta(\hat{a}^+)}{|v^+ k^- + v^- k^+ + i\Gamma_t|^2} \end{aligned}$$



▷ Tree level: $S_{\text{ucs}} = \text{Breit-Wigner} \times \text{shape function}$

At higher orders, ultra-collinear gluons between production and decay Wilson lines give a shifted Breit-Wigner $\Gamma_t/|\bar{a}^+ \gamma^2 \hat{v}^+ v^- - 2\Delta|^2$ and dependence on the decay angle

Towards the theory prediction for EEEC in top decays:

- ▷ Most of ingredients now ready for NNLL resummation.
- ▷ Numerical implementation in progress with SCETlib.
- ▷ Generalization to pp with fragmenting jet formalism.

Summary

Energy correlators have simple operator definition, enabling transparent analytic structure.

- ▷ factorization theorems established in the collinear and back-to-back limits
- ▷ simple measurement function, making analytic calculations more tractable

Back-to-back Sudakov structure in close analogy to small- q_T resummation.

Boost kernel derived from the operator definition, precise spectra in boosted kinematics.

$Z \rightarrow b\bar{b}$ (heavy boson decay):

- ▷ energy correlators on boosted, polarized objects
- ▷ quark-mass extraction, calibrated by peak ratios within the same jet

$\bar{B} \rightarrow X_s \gamma$ (heavy-to-light decay):

- ▷ factorization with SCET_I , SCET_II and SCET_+
- ▷ joint resummation of jettiness and EEC at NNLL

Outlook: sets the stage for energy correlators in top-quark decays $t \rightarrow Wb \rightarrow q\bar{q}'b$.

Thank you for your attention.

Acknowledgement

This project is funded by the European Union (ERC, TOPMASS, 101165601). Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Council. Neither the European Union nor the granting authority can be held responsible for them.



European Research Council

Established by the European Commission