

Open-charm perspectives for P1* in a nutshell



Open-charm perspectives

sub-MeV resolution, associated production

1. Heavy-light spectroscopy

- ✓ Sensitivity to high spins of heavy-light systems (f.e. D-waves)
- ✓ Access to basic properties of (narrow) exotics (f.e. $D_{s0}(2317)$)

2. Heavy-light decays

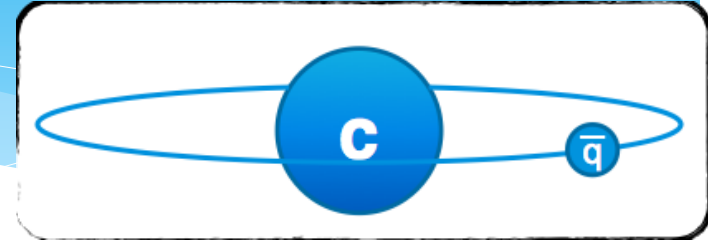
- ✓ Semi-leptonic (FF): *strong meets weak physics*
- ✓ Electro-weak (BSM): $c \rightarrow ug$ FCNC, CPV in D-Dbar mixing
- ✓ Light (strange) meson spectroscopy ($D_{(s)}$ hadronic decays)

3. Heavy-light production

- ✓ Dynamics: quark/gluons versus meson/baryons at various scales
- ✓ Charmonium-like resonance studies in XYZ mass regime

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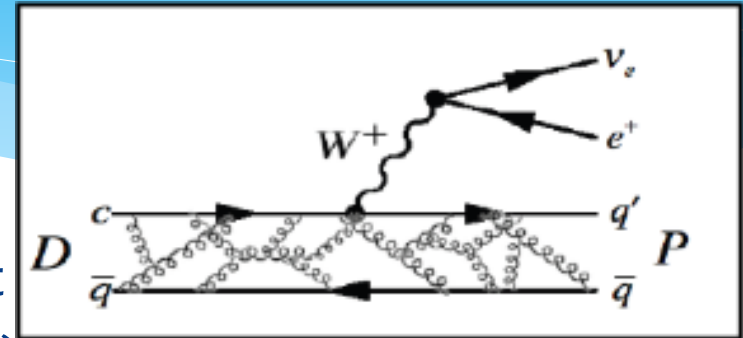
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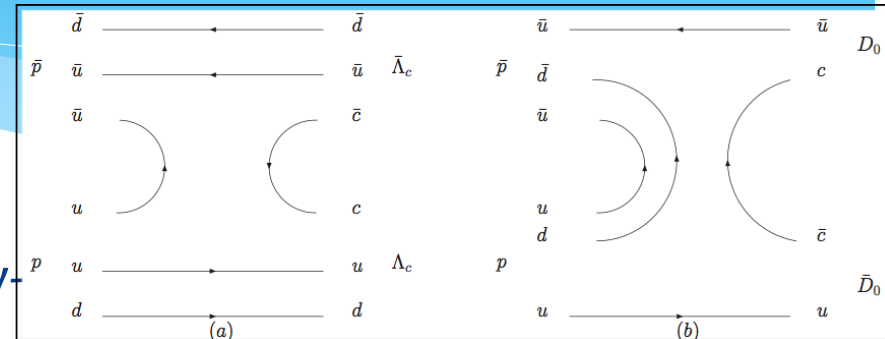


Open-charm perspectives

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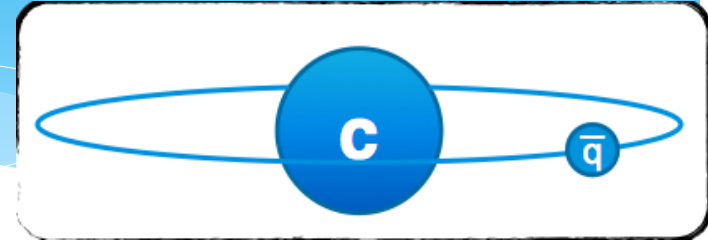
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1. Heavy-light spectroscopy

High profile, P2/P3 case

2. Heavy-light decays

- ✓ Semi-leptonic (FF): *strong meets weak physics*
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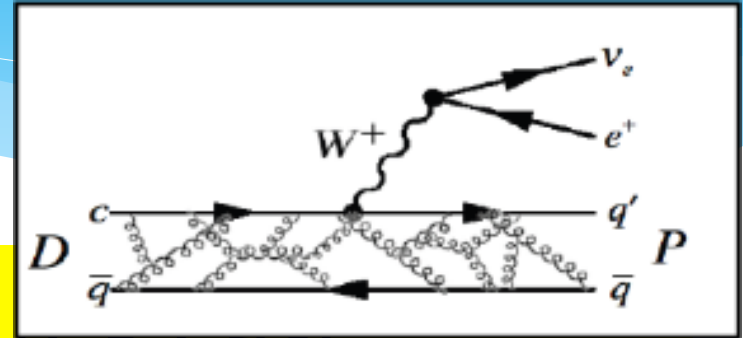
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Open-charm perspectives

sub-MeV resolution, associated production

1. Heavy-light spectroscopy

High profile, $P2/\pi_3$ case



2. Heavy-light decays

High profile, fierce competition,
 P_3 case

3. Heavy-light production

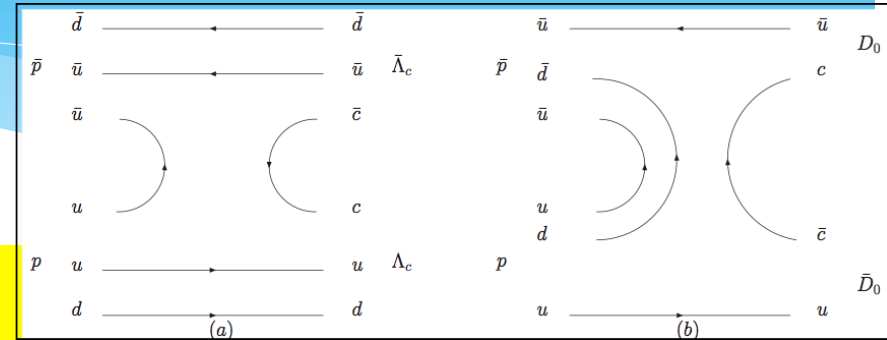
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Open-charm perspectives

sub-MeV resolution, associated production

1. Heavy-light spectroscopy

High profile, Λ_c case



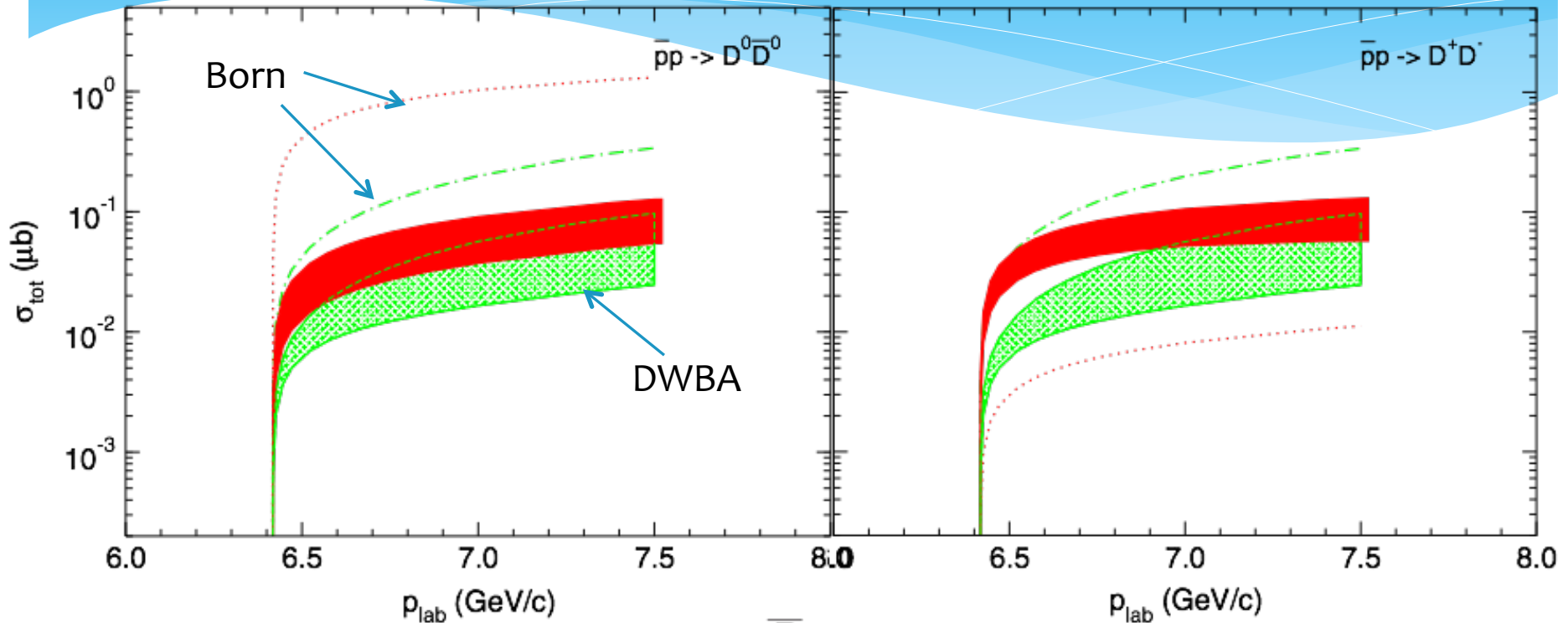
2. Heavy-light decays

High profile, fierce competition,
P3 case

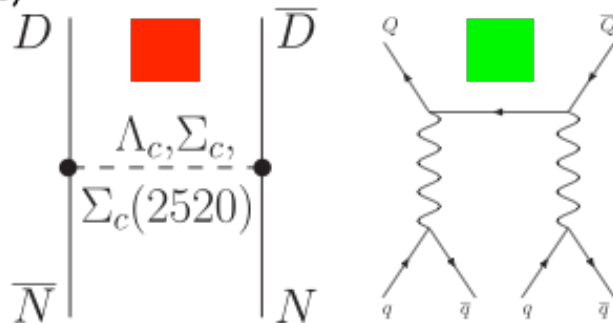
3. Heavy-light production

PANDA unique, feasible in P1,
ground work for physics program in P2/3

Open-charm production

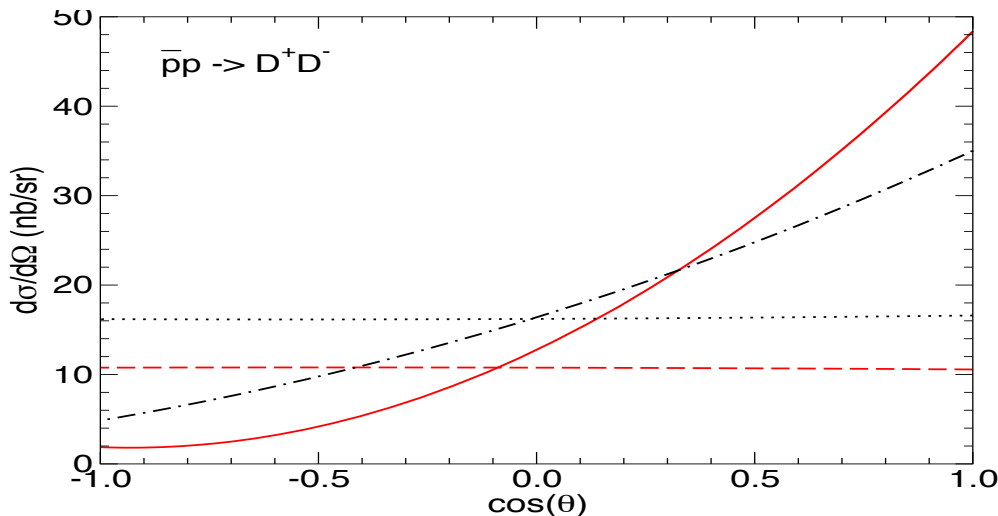
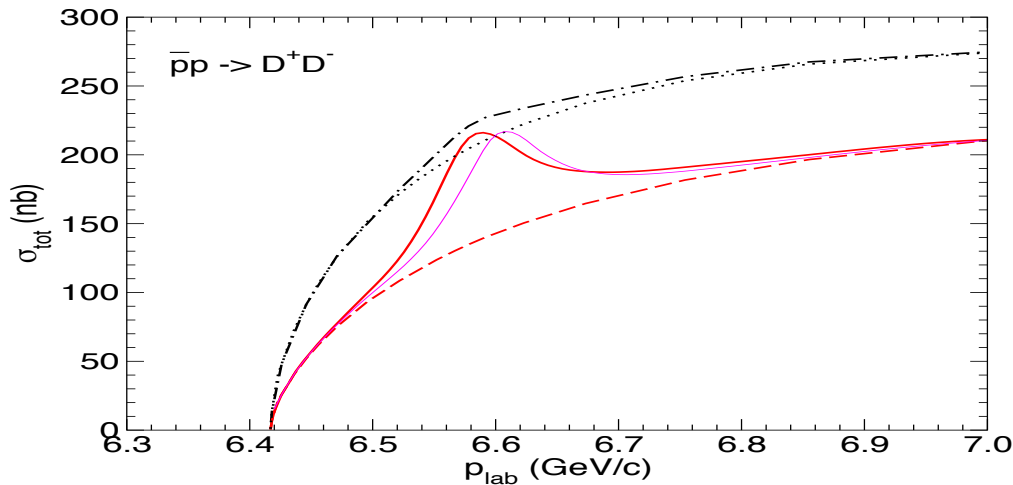


Non-resonant production,
 Haidenbauer&Krein,
 PRD89, 114003 (2014)

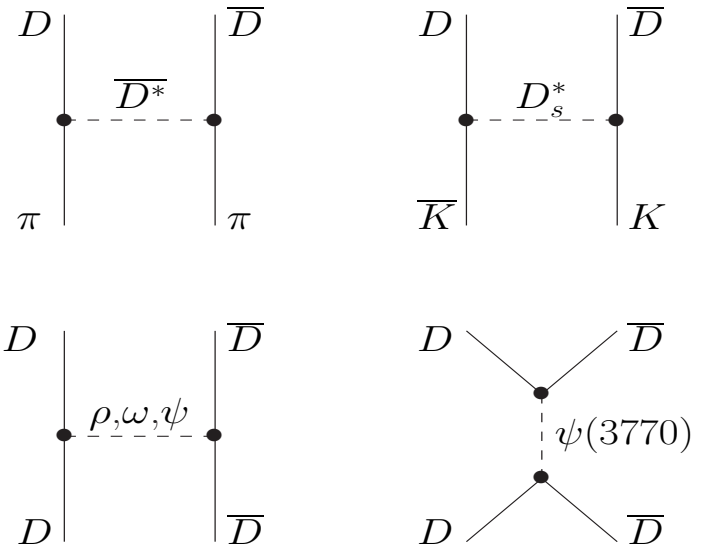


Open-charm production

With P-wave resonant production,
Haidenbauer&Krein, arXiv:1504.07909 (2015)



Juelich
Meson-baryon model
Effects of ISI/FSI

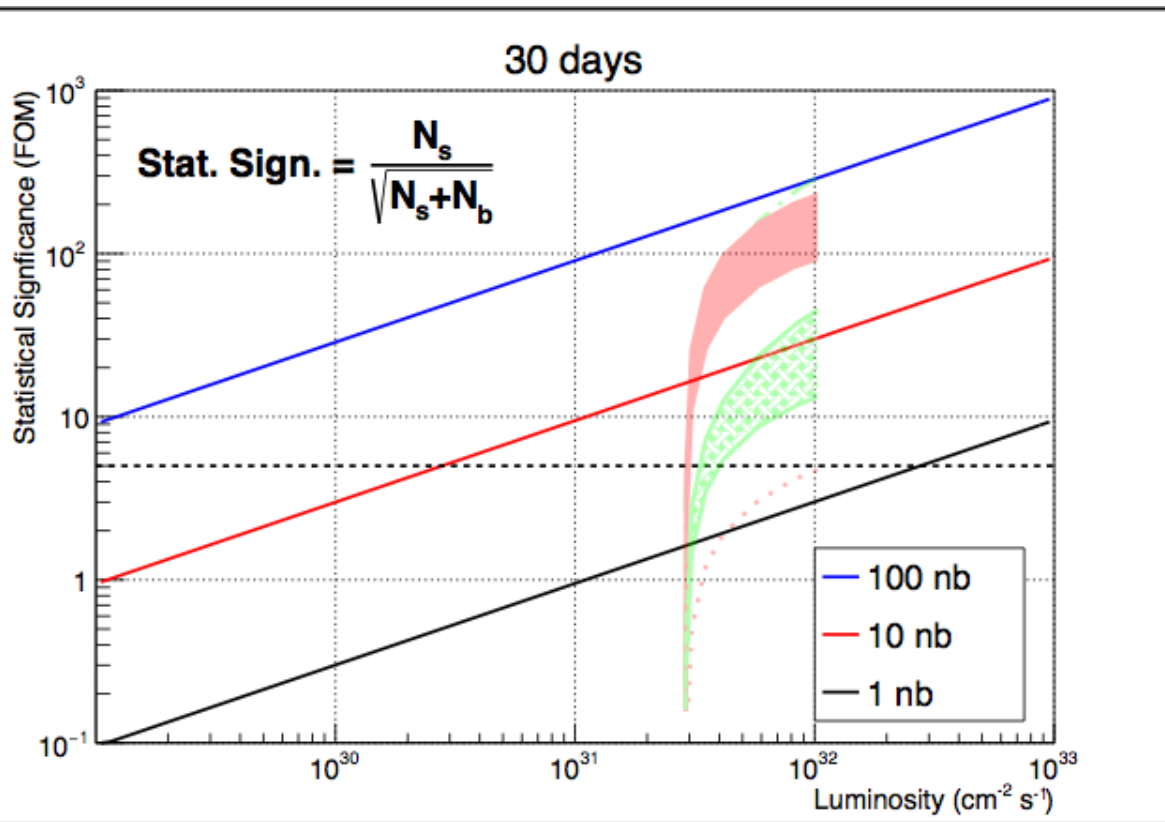


Resonance contribution
Predicted 20-80 nb

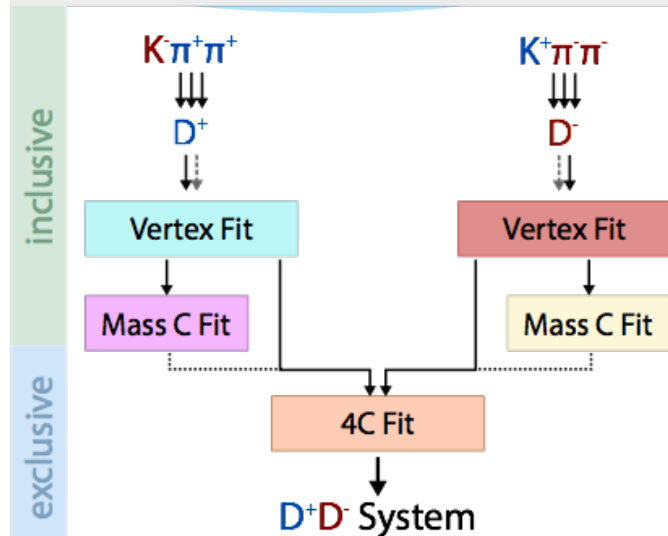
**Empirical information missing
to constrain model space**

Open-charm simulations (Andreas Herten, J.M.)

$$\bar{p}p \rightarrow D^+ D^- \rightarrow (K\pi\pi) + X$$



Reconstruction Scheme



Momentum:	6.5 GeV/c
Signal model:	data driven
Background model:	DPM
Efficiency:	0.18
Bckgrd reduction:	2.8×10^6
Total B.F.:	9.3×10^{-2}

Open-charm perspectives for P1

1. Possible MC analysis for P1 document
 - ✓ Case study: single and double-tag feasibility in
 - ✓ $\bar{p}p \rightarrow D\bar{D} \rightarrow \dots$
 - ✓ Observables: energy dependent (differential) cross sections
2. Who could contribute?
 - ✓ Elisabetta Prencipe (FZJ)?
 - ✓ Alexandros Apostolou (KVI-CART)
3. Required technical resources
 - ✓ Day-one setup in PandaRoot: settle on release?
 - ✓ Computing cluster at KVI-CART (50+ cores, 30 TB), 100% PANDA