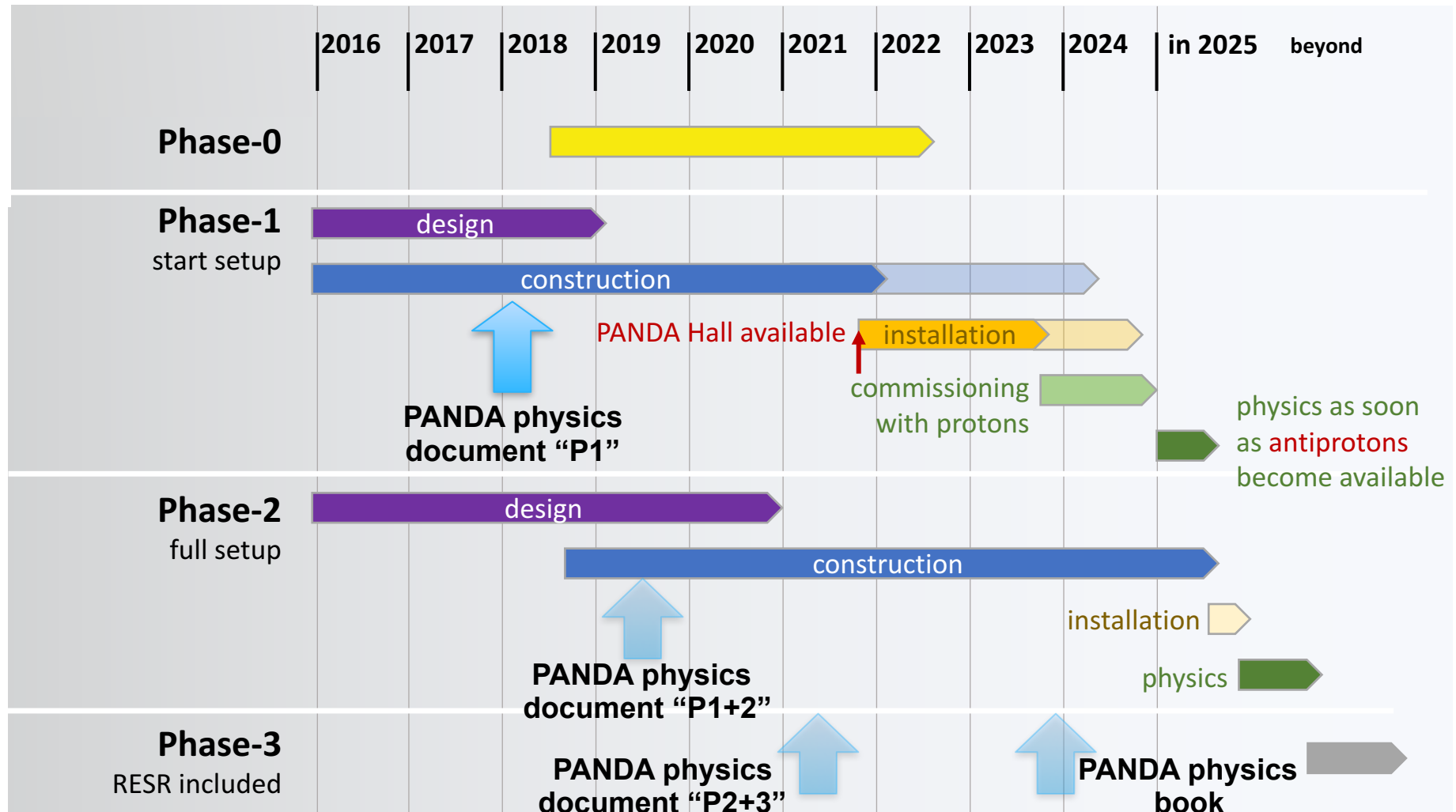


# Discussion - *physics* and *software* priorities

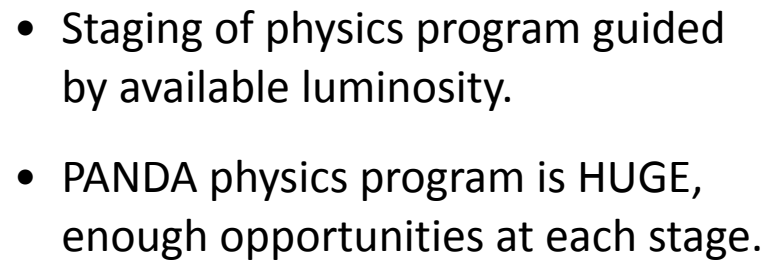


Where are the physics priorities?  
How is this linked to simulation activities?

# PANDA staging ...



► **Energy**



# Staging of PANDA physics papers with flagship show-cases

Conceptual compilation

## ✓ Short-term paper (publication end 2017) - Phase-1

- **light**: EMP in  $e+e^-/\mu+\mu^-$  channel
- **strange**: spin observables in  $\Xi\bar{\Xi}$  *production* and *basic properties* of excited states
- **charm**:  $X(3872)$  energy scan; open-charm *production*

## ✓ Mid-term paper (~2019) - Phase-1 + perspectives Phase-2

- **light**: glueball studies in  $\phi\phi$  decay, blind analysis and *PWA*; GDAs in EMP and in unphysical region
- **strange**: spin-parity of  $S=2$  baryons with *PWA* and spin observables in  $S=3$  systems
- **charm**: high-spin spectroscopy with *PWA*;  $p\bar{p}+d$  Z-state spectroscopy

## ✓ Long-term paper (~2021) - Phase-2 + perspectives Phase-3

- **light**: EMP remaining channels/observables
- **strange**:  $p\bar{p}+A$  physics and hypernuclei
- **charm**:  $D_s$  scan and open-charm decays

## ✓ —> Physics book (~2022)

Topic	Observable	Beam momentum	Subscription	Priority
<b>Charmonium</b>				
hc scan	xsecs	scan: 5.6 GeV/c	no subscription	MED
Angular $\chi_c(1,2)$ distributions	diff. xsecs	5.54 and 5.72 GeV/c	no subscription	MED
High spin 3D2 state	diff. xsecs	3.678 GeV/c	Zhiqing Liu / Mainz	HIGH
<b>Charmonium Exotics</b>				
X(3872) energy scan	xsecs	7 GeV/c	GSI	HIGH
X $\rightarrow$ Z(3730) transition	branching fraction		FZJ	MED
X(3872) open-charm decays	branching fraction		JINR	MED
Zc(3900) production in $p\bar{p}+d$	xsecs		NSU	MED
<b>Heavy-light Systems</b>				
D $\bar{D}$ bar production	(diff) xsecs	>6.5 GeV/c	KVI-CART/FZJ	MED
<b>Hyperons structure</b>				
Cascade and Omega spectroscopy	missing states, branching fractions, JP	~4 to ~9 GeV/c (various dep. on specific states)	FZJ, Bonn	HIGH
<b>Hyperons dynamics</b>				
Lambda-Lambda $\bar{d}$ bar	(diff) xsecs, pol. pars		Uppsala	HIGH
Cascade-Cascade $\bar{d}$ bar	(diff) xsecs, pol. pars		Uppsala	HIGH
Omega-Omega $\bar{d}$ bar	(diff) xsecs, pol. pars		Uppsala	MED
<b>Light-meson spectroscopy</b>				
XYZ in light-quark sector: Y(2175)	xsecs (PWA)	3.75 GeV/c	no subscription	MED
light glueball searches: G $\rightarrow$ ...	xsec, PWA	3.75 GeV/c	no subscription	MED
tensor glueball searches: $p\bar{p}$ bar $\rightarrow\phi\phi$ scan	xsecs, PWA	scan: up to 2.7 GeV/c	Bochum	HIGH
KKpi molecule: $a_1(1420)\rightarrow 3\pi$ in $p\bar{p}$ bar $\rightarrow 4\pi$	xsecs, PWA	3.75 GeV/c	no subscription	MED
<b>Time-like FF</b>				
EMFF in $p\bar{p}$ bar $\rightarrow e^+e^-$	GE, GM, R	~up to 4 GeV/c	Mainz/Orsay	MED
EMFF in $p\bar{p}$ bar $\rightarrow \mu^+\mu^-$	GE, GM, R	~1.5 GeV/c	Mainz/Orsay	MED
EMFF in unphysical regime	GE, GM, R, phase	parallel to XYZ studies	Mainz/Orsay	HIGH
<b>Hard exclusive processes</b>				
$p\bar{p}$ bar $\rightarrow gg$	GDA		no subscription	MED
$p\bar{p}$ bar $\rightarrow g\pi^0$	GDA		Mainz	HIGH
<b>Hadrons in nuclei</b>				
Hyperon - Antihyperon production	Ybar potential	1.6 GeV, 2.9 GeV	Mainz	HIGH
Color transparency	nuclear CT for various mesons and p, pbar	~8 GeV/c, up to 15 GeV/c for p, pbar	Gauhati (prelim)	MED
Short range correlations	nucl. high mom. pn, pp, N-Delta and Delta-Delta SRC	~8 GeV/c	FZJ	MED
Delta-Delta component in deuteron	(p pi+) (pi- pi-) with large pz gap	~8 GeV/c	FZJ	HIGH

Phase-One flagships

# Physics priorities - the main punchlines

- ✓ **Most of the physics pillars** will be **active** at early phases of PANDA
- ✓ **Exceptions:** hypernuclei, electroweak studies, Drell Yan studies
- ✓ Today's **highest interest:** hyperons, hidden-charm, electromagnetic form factors
- ✓ D1-cases, but **lack of momentum:** light-meson spectroscopy, hadrons in nuclei

# Software “wishes” from a physics point-of-view

- ✓ Implementation of geometry, digitisation of phase-one start-setup; ongoing updates of EMC, STT, ...!
- ✓ Tracking: development of (forward) tracking algorithms, suited for non-IP channels and preferably time-based
- ✓ Constrain fitters: mass, vertex, 4C, decay tree fitters...
- ✓ PID: towards *realistic* algorithms (ML)
- ✓ PWA: necessity for all spectroscopy activities (in particular for light-meson program!!!)
- ✓ Generators: pbar-A, DPM++, ...

# Discussion - *physics* and *software* priorities

What are your priorities as PWG?

How can PWGs contribute to urgent software developments?

How can software group contribute to PWG activities?

<Fill in your question>