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Using an e^+e^- collision data sample of $(27.08 \pm 0.14) \times 10^8$ $\psi(3686)$ events collected by the BESIII detector, we report the first observation of $\chi_{cJ} \to \Omega^- \bar{\Omega}^+$ ($J = 0, 1, 2$) decays with significances of $5.6\sigma, 6.4\sigma$, and 18σ, respectively, where the χ_{cJ} mesons are produced in the radiative $\psi(3686)$ decays. The branching fractions are determined to be $\mathcal{B}(\chi_{c0} \to \Omega^- \bar{\Omega}^+) = (3.51 \pm 0.54 \pm 0.29) \times 10^{-5}$, $\mathcal{B}(\chi_{c1} \to \Omega^- \bar{\Omega}^+) = (1.49 \pm 0.23 \pm 0.10) \times 10^{-5}$, and $\mathcal{B}(\chi_{c2} \to \Omega^- \bar{\Omega}^+) = (4.52 \pm 0.24 \pm 0.18) \times 10^{-5}$, where the first and second uncertainties are statistical and systematic, respectively.

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I. INTRODUCTION

The study of charmonium decays into baryon antibaryon ($B\bar{B}$) pairs provides a powerful tool for investigating many topics in quantum chromodynamics, such as the interference between the strong and electromagnetic interactions, the color octet and singlet contributions, the violation of helicity conservation, the "12% rule," SU(3) flavor symmetry breaking effects, the transverse polarization and the electric dipole momentum of baryons, and many more [1–6]. In contrast to

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J/ψ decays [7], the decays of the P-wave charmonium states, χ_{cJ} ($J = 0, 1, 2$), to $B\bar{B}$ have a nontrivial color-octet contribution [8,9]. Therefore, further experimental studies of baryonic χ_{cJ} decays will provide useful input to theoretical calculations involving the color-octet wave function, and will enrich our knowledge of the nature of these charmonium states.

The color-octet model (COM) [10] can be used to explain the difference in the measured values of the branching fractions (BFs) of $\chi_{c1,2} \to p\bar{p}$ decays [7] and those calculated from perturbative quantum chromodynamics. In addition, the measured BFs [7] of $\chi_{c1,2} \to \Sigma^+ \bar{\Sigma}^-$ and $\Sigma^0 \bar{\Sigma}^0$ decays show good agreement with COM predictions, while the agreement is slightly worse when comparing the measured BFs of $\chi_{c0} \to \Sigma^+ \bar{\Sigma}^-$ and $\Sigma^0 \bar{\Sigma}^0$ [7] to the results of calculations based on the charm-meson loop mechanism [11], which has much in common with the COM. However, the COM predictions for the BFs of $\chi_{c1,2} \to \Lambda\bar{\Lambda}$ decays are about a magnitude lower than the experimental results [7]. Therefore, more baryonic χ_{cJ} decays are needed as inputs to further study the COM contribution.

In the decays $\chi_{cJ} \to p\bar{p}$, $\Lambda\bar{\Lambda}$, $\Sigma\bar{\Sigma}$ discussed above, the baryons belong to the ground state octet. It is desirable to extend these studies to decays of χ_{cJ} into pairs of decuplet ground-state baryons with spin 3/2. So far only $\chi_{c0} \to \Sigma(1385)^\pm \bar{\Sigma}(1385)^\mp$ decays [12] have been studied by the BESIII Collaboration. The decay $\chi_{cJ} \to \Omega^- \bar{\Omega}^+$ is unique due to the presence of three pairs of strange quarks in the final state. This may give us a distinct way for understanding quantum chromodynamics. The decay $\chi_{cJ} \to \Omega^- \bar{\Omega}^+$ is also advantageous from the experimental point of view, as the Ω^- is the only baryon of the ground-state decuplet that decays through the weak interaction; its long lifetime allows it to be reconstructed with low levels of background.

In this paper, we report the first measurements of the BFs of $\chi_{cJ} \to \Omega^- \bar{\Omega}^+$ decays, where the χ_{cJ} mesons are produced in $\psi(3686) \to \gamma\chi_{cJ}$ decays [7], based on a sample of $(27.08 \pm 0.14) \times 10^8$ $\psi(3686)$ events [13] collected by the BESIII detector.

II. BESIII DETECTOR AND MONTE CARLO SIMULATION

The BESIII detector [14,15] records e^+e^- collisions provided by the BEPCII storage ring [16], which operates with a peak luminosity of 1×10^{33} cm^{-2} s^{-1} in the center-of-mass energy range from 2.00 to 4.95 GeV. The cylindrical core of the BESIII detector covers 93% of the full solid angle and consists of a helium-based multilayer drift chamber (MDC), a plastic scintillator time-of-flight system (TOF), and a CsI(Tl) electromagnetic calorimeter (EMC), which are all enclosed in a superconducting solenoidal magnet providing a 1.0 T magnetic field [17]. The solenoid is supported by an octagonal flux-return yoke with resistive plate counter muon identification modules interleaved with steel. The charged-particle momentum resolution at 1 GeV/c is 0.5%, and the dE/dx resolution is 6% for the electrons from Bhabha scattering at 1 GeV. The EMC measures photon energies with a resolution of 2.5% (5%) at 1 GeV in the barrel (end-cap) region. The time resolution of the TOF barrel part is 68 ps, while that of the endcap part is 110 ps. The end-cap TOF system was upgraded in 2015 using multigap resistive plate chamber technology, providing a time resolution of 60 ps [18–20].

Monte Carlo (MC) simulated data samples produced with a GEANT4 [21] based software package, which includes the geometric description of the BESIII detector and the detector response, are used to optimize the event selection criteria, estimate the signal efficiency and the level of background. The simulation models the beam energy spread and initial-state radiation in the e^+e^- annihilation using the generator KKMC [22]. The inclusive MC sample includes the production of the $\psi(3686)$ resonance, the initial-state radiation production of the J/ψ meson, and the continuum processes incorporated in KKMC [22]. Particle decays are generated by EvtGen [23,24] for the known decay modes with BFs taken from the Particle Data Group [7] and LUNDCHARM [25,26] for the unknown ones. Final-state radiation from charged final-state particles is included using the PHOTOS package [27]. To determine the detection efficiency, signal MC samples are generated for each signal process. The decays $\psi(3686) \to \gamma\chi_{cJ}$ are generated according to the angular distributions from Ref. [28], where the polar angle θ^* of the radiative photon, defined with respect to the z axis which is along the e^+ beam direction in the rest system of the $\psi(3686)$ meson, is distributed according to $(1 + \cos^2\theta^*)$, $(1 - \frac{1}{3}\cos^2\theta^*)$, and $(1 + \frac{1}{13}\cos^2\theta^*)$ for $\psi(3686) \to \gamma\chi_{c0,1,2}$ decays, respectively. The $\chi_{cJ} \to \Omega^-\bar{\Omega}^+$ decays are generated uniformly in phase space (PHSP), along with generic Ω^- and $\bar{\Omega}^+$ decays.

III. EVENT SELECTION

The cascade decay of interest is $\psi(3686) \to \gamma\chi_{cJ}$, $\chi_{cJ} \to \Omega^-\bar{\Omega}^+$, with $\Omega^-(\bar{\Omega}^+) \to \Lambda K^-(\bar{\Lambda}K^+)$ and $\Lambda(\bar{\Lambda}) \to p\pi^-(\bar{p}\pi^+)$. A full reconstruction method suffers from a lower detection efficiency compared to a partial reconstruction. Hence, the radiative γ and one of the two Ω baryons are fully reconstructed, while the other Ω is not reconstructed in the event. In this paper, we use Ω^- to denote the reconstructed Ω, and $\bar{\Omega}^+$ as the unreconstructed baryon, with charge conjugation implicit. The masses recoiling against the γ and $\gamma\Omega^-$ are subsequently used to search for the χ_{cJ} and $\bar{\Omega}^+$ signals, respectively.

The charged tracks in the MDC are required to have a polar angle θ with respect to the beam direction within the MDC acceptance $|\cos\theta| < 0.93$. In order to perform the particle identification (PID), the dE/dx and TOF information are combined to estimate a likelihood value $\mathcal{L}(h)(h = p, K, \pi)$ for each hadron h hypothesis. Charged tracks are identified as protons after satisfying the requirements of $\mathcal{L}(p) > \mathcal{L}(K)$, $\mathcal{L}(p) > \mathcal{L}(\pi)$ and $\mathcal{L}(p) > 0.001$, and kaons with $\mathcal{L}(K) > \mathcal{L}(\pi)$. If there is more than one K^- candidate, the one with the highest $\mathcal{L}(K)$ is kept for further study. The remaining charged tracks are assigned as pions by default. Events are required to contain at least one combination of $p\pi^-K^-$ candidates.

To reconstruct Λ candidates, the $p\pi^-$ pairs are fitted to a common origin point [29]. The Λ candidates are required to satisfy $L_\Lambda/\sigma_{L_\Lambda} > 2$, where L_Λ and σ_{L_Λ} are the distance of the common vertex of the $p\pi^-$ pair away from the interaction point, and the corresponding uncertainty, respectively. The invariant mass of $p\pi^-$ ($M_{p\pi^-}$) must lie within the Λ signal region, $M_{p\pi^-} \in [1.111, 1.121]$ GeV/c^2. If more than one Λ candidate is found, that one with the minimum value of $|M_{p\pi^-} - m_\Lambda|$ is chosen, where m_Λ is the known Λ mass [7]. Subsequently, the Λ candidate is combined with the K^- to reconstruct the Ω^- candidate. Similarly, the ΛK^- pair is fitted to a common vertex. The Ω^- candidate is required to satisfy $L_\Omega/\sigma_{L_\Omega} > 2$, where L_Ω and σ_{L_Ω} are the distance of the common vertex of the ΛK^- pair away from the interaction point, and the corresponding uncertainty, respectively. The invariant mass of ΛK^- ($M_{\Lambda K^-}$) is required to lie within the Ω^- signal region, $M_{\Lambda K^-} \in [1.664, 1.681]$ GeV/c^2. If both Ω^- and $\bar{\Omega}^+$ candidates are found in an event, we randomly retain only one of them to avoid double counting.

Photon candidates are reconstructed from isolated showers in the EMC. The deposited energy of each shower is required to be greater than 25 MeV in the barrel region $(|\cos\theta| < 0.8)$ and greater than 50 MeV in the endcap region $(0.86 < |\cos\theta| < 0.92)$. To reject showers that originate from charged tracks, the angle between the shower and its closest charged track must be greater than $10°$. In addition, the timing of each shower is required to be within 700 ns of the e^-e^+ collision, in order to reduce contributions from electronic noise and beam-related background. At least one photon candidate is demanded in an event.

The best radiative photon is selected with the minimum value of $|RM_{\gamma\Omega^-} - m_{\bar{\Omega}^+}|$ from the photon candidates, where

$RM_{\gamma\Omega^-}$ is the mass recoiling against the $\gamma\Omega^-$ system, and $m_{\bar{\Omega}^+}$ is the known $\bar{\Omega}^+$ mass [7]. For the signal modes, the unreconstructed $\bar{\Omega}^+$ peaks in the $RM_{\gamma\Omega^-}$ spectrum. The $\bar{\Omega}^+$ signal region is defined as $RM_{\gamma\Omega^-} \in [1.647, 1.703]$ GeV/c^2, corresponding to approximately $\pm 3\sigma$ of the $\bar{\Omega}^+$ mass, where σ is the fitted resolution of $RM_{\gamma\Omega^-}$ from the signal MC samples.

IV. BACKGROUND STUDY

The decay $\psi(3686) \to \Omega^-\bar{\Omega}^+$, when occurring with a fake soft photon, constitutes a background process. The mass recoiling against the reconstructed Ω^- (RM_{Ω^-}) for this background accumulates around $m_{\bar{\Omega}^+}$, as shown in Fig. 1. Studies performed on MC simulation indicate that the requirement of $RM_{\Omega^-} > 1.73$ GeV/c^2 suppresses 98.9% of $\psi(3686) \to \Omega^-\bar{\Omega}^+$ background events with only a loss of 0.03% in signal efficiency.

Backgrounds from continuum quantum electrodynamics processes, cosmic rays, beam-gas, and beam-wall interactions are estimated by using the data samples collected outside of the $\psi(3686)$ peak, and are found to be negligible.

Potential peaking backgrounds are investigated by studying the surviving events in the Ω^- signal region from the inclusive MC sample, and the events in the Ω^- mass sideband regions from data (defined as $M_{\Lambda K^-} \in ([1.647, 1.655] \cup [1.69, 1.699])$ GeV/c^2), respectively. These studies indicate that there are no significant sources of peaking backgrounds.

V. SIGNAL YIELDS AND BFS

To determine the signal yields of $\chi_{cJ} \to \Omega^-\bar{\Omega}^+$ events, an unbinned maximum-likelihood fit is performed to the

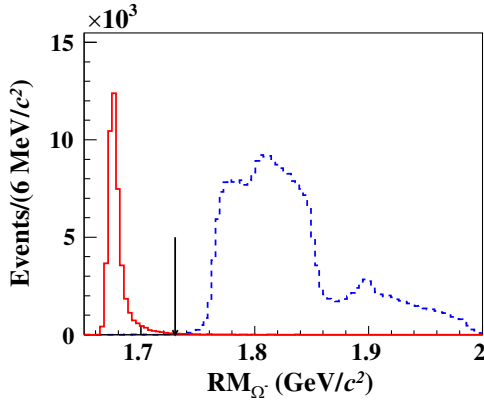FIG. 1. Recoil mass RM_{Ω^-}. The blue dotted line histogram is from the signal MC samples of $\chi_{c0,1,2} \to \Omega^-\bar{\Omega}^+$, where the proportions of the three signal channels are distributed according to the measured BFs from this study. The red solid line histogram is from the MC sample of background $\psi(3686) \to \Omega^-\bar{\Omega}^+$ decays, and the black arrow denotes the chosen RM_{Ω^-} requirement. The normalization between the signal MC and background MC samples is arbitrary.
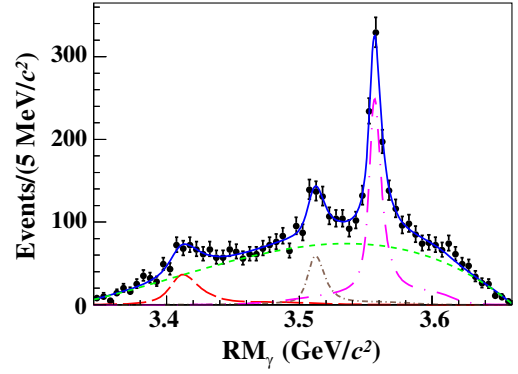

FIG. 2. Fit to the RM_γ distribution of the accepted candidates in data. The dots with error bars are data, the blue solid line is the total fit, the green short dashed line represents the fitted combinatorial background shape, and the red long dashed, dark brown short dot-dashed and magenta long dot-dashed lines indicate the χ_{c0}, χ_{c1}, and χ_{c2} signals, respectively.

recoil-mass spectrum against the radiative photon (RM_γ), as shown in Fig. 2. In the fit, the signal shape of each signal mode is described by the corresponding MC simulated shape convolved with a Gaussian function with free parameters. The Gaussian function is used to compensate for the minor mass shift and resolution difference between data and MC simulation. The background shape is described by a third-order Chebyshev polynomial function. The statistical significances are 6.3σ, 7.1σ, and 23σ for χ_{c0}, χ_{c1}, and χ_{c2} decays, respectively, which are determined from the change in the log-likelihood values and the corresponding change in the number of degrees of freedom with and without including the signal contributions in the fit. In the significance calculations, systematic uncertainties are taken into account as discussed below. The signal yields and detection efficiencies are summarized in Table I.

The BFs of $\chi_{cJ} \to \Omega^-\bar{\Omega}^+$ decays are calculated with the formula

$$\mathcal{B}(\chi_{cJ} \to \Omega^-\bar{\Omega}^+) = \frac{N_{\chi_{cJ}}^{\mathrm{obs}}}{N_{\psi(3686)} \cdot \mathcal{B}_{\psi(3686)\to\gamma\chi_{cJ}} \cdot \epsilon_{\chi_{cJ}}}, \quad (1)$$

where $N_{\chi_{cJ}}^{\mathrm{obs}}$ is the signal yield, $N_{\psi(3686)}$ is the total number of $\psi(3686)$ events, $\epsilon_{\chi_{cJ}}$ is the detection efficiency including the subsequent Ω and Λ decays, and $\mathcal{B}_{\psi(3686)\to\gamma\chi_{cJ}}$ is the BF

TABLE I. The χ_{cJ} signal yields ($N_{\chi_{cJ}}^{\mathrm{obs}}$), detection efficiencies ($\epsilon_{\chi_{cJ}}$), BFs of $\chi_{cJ} \to \Omega^-\bar{\Omega}^+$ ($\mathcal{B}$) and the signal significances (Sig.). Here the uncertainties are statistical only.

Mode	$N_{\chi_{cJ}}^{\mathrm{obs}}$	$\epsilon_{\chi_{cJ}}(\%)$	Sig.(σ)	$\mathcal{B}(\times 10^{-5})$
χ_{c0}	284 ± 44	3.05	5.6	3.51 ± 0.54
χ_{c1}	277 ± 42	7.02	6.4	1.49 ± 0.23
χ_{c2}	1038 ± 56	8.91	18	4.52 ± 0.24

of the $\psi(3686) \to \gamma\chi_{cJ}$ decay [7]. The measured BFs for the three signal modes are listed in Table I.

VI. SYSTEMATIC UNCERTAINTY

The systematic uncertainties originate from the event selection criteria, the fit to the RM_γ distribution, the size of the MC samples, the assumptions in the signal MC generator, the knowledge of the input BFs [7], and the total number of $\psi(3686)$ events [13]. The sources from the event selection criteria are associated with the reconstruction efficiencies for the photon and Λ, the tracking and PID efficiencies for kaons, and the requirements placed on $L_\Omega/\sigma_{L_\Omega}$, $M_{\Lambda K^-}$ and $RM_{\gamma\Omega^-}$. In the fit to RM_γ, systematic uncertainties arise from the signal and background shapes.

The systematic uncertainty associated with the photon reconstruction efficiency is estimated to be 1.0% per photon [30]. The uncertainties arising from the tracking and PID efficiencies are both 1.0% per kaon track [31].

The systematic uncertainty associated with the Λ reconstruction efficiency includes the effects from the tracking (PID) efficiencies for protons and pions, and requirements on $M_{p\pi^-}$ and $L_\Lambda/\sigma_{L_\Lambda}$. The size of the uncertainty is assessed through studies of a control sample of $J/\psi \to pK^-\bar{\Lambda} +$ c.c. decays. The momentum-dependent differences on the Λ reconstruction efficiencies between data and MC simulation, which are obtained from the control sample, are used to reweight the signal MC samples. The differences between the nominal detection efficiencies and those after re-weighting, which are 3.6%, 1.2%, and 0.5% for χ_{c0}, χ_{c1}, and χ_{c2}, respectively, are taken as the systematic uncertainties.

The systematic uncertainty associated with the requirement of $L_\Omega/\sigma_{L_\Omega} > 2$ is evaluated with the control sample of $\psi(3686) \to \Omega^-\bar{\Omega}^+$ decays. The difference in the efficiencies from this requirement between data and MC simulation is taken as the systematic uncertainty, which is 0.6%.

The systematic uncertainty associated with the requirement on $M_{\Lambda K^-}$ is estimated by changing the mass resolution. In the nominal procedure, the requirement of $M_{\Lambda K^-} \in [1.664, 1.681]$ GeV/c^2 is obtained by the fit to $M_{\Lambda K^-}$ spectrum from the signal MC samples, which is about $\pm 3\sigma$ around the known Ω^- mass. With the same fit procedure, an alternative requirement of $M_{\Lambda K^-} \in [1.664, 1.679]$ GeV/c^2 is calculated from data. The relative differences in the BFs arising from these two requirements are taken as the systematic uncertainties, which are 1.1%, 0.2%, and 0.2% for χ_{c0}, χ_{c1}, and χ_{c2}, respectively.

The systematic uncertainty due to the requirement placed on the $RM_{\gamma\Omega^-}$ is studied by changing the range from [1.647, 1.703] to [1.644, 1.707] GeV/c^2. The relative changes in the BFs are taken as the corresponding systematic uncertainties, which are 2.0%, 2.0%, and 0.9% for χ_{c0}, χ_{c1}, and χ_{c2}, respectively.

Two sources of uncertainty associated with the signal shape are considered. One is due to wrongly reconstructed photons. Since we only reconstruct the radiative photon and one Ω^-, it is possible for the chosen γ to not arise from the $\psi(3686)$ decay. These photons could be from the $\bar{\Omega}^+$ decay or fake photons. To be conservative, we only extract the correct radiative photons, convolved with a Gaussian function with floated parameters, as an alternate shape to investigate the effect from the signal shape. The relative differences in the BFs, 2.3%, 4.7%, and 1.5%, are assigned as the uncertainties for χ_{c0}, χ_{c1}, and χ_{c2}, respectively. The second source is the E1 transition effect [32] on the signal shape. To assess the effect of this, the correction method described in Ref. [33] is applied and the effects on the BFs are found to be negligible.

The systematic uncertainty associated with the background shape is estimated by changing the background shape from the third-order Chebyshev polynomial to a fifth-order Chebyshev polynomial or the RM_γ shape in the $M_{\Lambda K^-}$ side-band region. The largest differences in the BFs from these alternative treatments, of 6.0%, 0.7%, and 0.7%, are assigned as systematic uncertainties for χ_{c0}, χ_{c1}, and χ_{c2}, respectively.

The MC generators for the $\chi_{c1,2} \to \Omega^-\bar{\Omega}^+$ decays are modified to include the angular distribution of $1 + \alpha\cos^2\vartheta$, where ϑ is the polar angle of Ω^- in the rest frame of χ_{cJ} mesons. By considering the dominant contribution to possess a relative orbital angular momentum of 1 between the Ω^- and $\bar{\Omega}^+$, we take the conservative values of $\alpha = \pm 1$ to generate alternative signal MC samples. The greatest differences on the detection efficiencies are taken as the systematic uncertainties from the this source, which is 1.4% for both χ_{c1} and χ_{c2} decays. Since the spin of χ_{c0} meson is 0, the angular distribution of $\chi_{c0} \to \Omega^-\bar{\Omega}^+$ decay is expected to be flat, and thus there is an negligible systematic uncertainty from this source.

The systematic uncertainties arising from the finite MC sample sizes are 0.5%, 0.3%, and 0.3% for χ_{c0}, χ_{c1}, and χ_{c2}, respectively. The uncertainty associated with the number $\psi(3686)$ events is 0.5% [13]. The systematic uncertainties arising from the knowledge of the BFs of $\psi(3686) \to \gamma\chi_{cJ}$ are 2.0%, 2.5%, 2.1% for χ_{c0}, χ_{c1}, and χ_{c2} [7]. The systematic uncertainties arising from the BFs of $\Omega^- \to \Lambda K^-$, and $\Lambda \to p\pi^-$ are 1.0% and 0.8% [7], respectively.

Table II summarizes all of the systematic uncertainties discussed above. The total systematic uncertainties on the BFs of $\chi_{cJ} \to \Omega^-\bar{\Omega}^+$ are the quadratic sums of each corresponding source.

The signal significances are estimated again after considering the systematic effects of the requirements of $M_{\Lambda K^-}$ and $RM_{\gamma\Omega^-}$, and the signal and background shapes in the fit to RM_γ. Based on the different variations, the lowest significances are 5.6σ, 6.4σ, and 18σ for χ_{c0}, χ_{c1}, and χ_{c2}, respectively, as listed in Table I.

TABLE II. Summary of the relative systematic uncertainties on the BFs of $\chi_{cJ} \to \Omega^- \bar{\Omega}^+$ decays.

Source	$\chi_{c0}(\%)$	$\chi_{c1}(\%)$	$\chi_{c2}(\%)$
Photon reconstruction	1.0	1.0	1.0
Kaon tracking	1.0	1.0	1.0
Kaon PID	1.0	1.0	1.0
Λ reconstruction	3.6	1.2	0.5
$L_\Omega/\sigma_{L_\Omega}$ requirement	0.6	0.6	0.6
$M_{\Lambda K^-}$ requirement	1.1	0.2	0.2
$RM_{\gamma\Omega^-}$ requirement	2.0	2.0	0.9
Signal shape	2.3	4.7	1.5
Background shape	6.0	0.7	0.7
MC generator	Negligible	1.4	1.4
MC sample size	0.5	0.3	0.3
Cited $\mathcal{B}_{\psi(3686)\to\gamma\chi_{cJ}}$	2.0	2.5	2.1
Cited $\mathcal{B}_{\Omega^-\to\Lambda K^-}$	1.0	1.0	1.0
Cited $\mathcal{B}_{\Lambda\to p\pi^-}$	0.8	0.8	0.8
$\psi(3686)$ number	0.5	0.5	0.5
Total	8.3	6.5	3.9

VII. SUMMARY

In summary, utilizing the world's largest $\psi(3686)$ sample taken with the BESIII detector, we observe the $\chi_{c0,1,2} \to \Omega^- \bar{\Omega}^+$ decays for the first time based on a partial reconstruction method, where only one of the Ω^- and $\bar{\Omega}^+$ baryons is fully reconstructed in each event. The measured BFs are $\mathcal{B}(\chi_{c0} \to \Omega^- \bar{\Omega}^+) = (3.51 \pm 0.54 \pm 0.29) \times 10^{-5}$, $\mathcal{B}(\chi_{c1} \to \Omega^- \bar{\Omega}^+) = (1.49 \pm 0.23 \pm 0.10) \times 10^{-5}$, and $\mathcal{B}(\chi_{c2} \to \Omega^- \bar{\Omega}^+) = (4.52 \pm 0.24 \pm 0.18) \times 10^{-5}$. Here the first and second uncertainties are statistical and systematic, respectively. It is noteworthy that the measured BF of $\chi_{c0} \to \Omega^- \bar{\Omega}^+$ is one order of magnitude smaller than those of χ_{c0} decaying to baryon antibaryon pairs with spin 1/2 and 3/2 [7], which will be useful for theorists to investigate the helicity selection rule evading mechanism in χ_{c0} decays. This is the first observation of χ_{cJ} decays into a pair of decuplet ground-state baryons with spin 3/2. The $\chi_{cJ} \to \Omega^- \bar{\Omega}^+$ decays can also be used to probe the spin polarization of Ω^- baryon in the charmonium production at the future tau-charm factories [34–36].

ACKNOWLEDGMENTS

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