相对论重离子碰撞中部分相干源的相干因子

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给出了两种统计系综下相对论重离子碰撞中部分相干源的相干因子的表达式

关键词: 相对论重离子碰撞, 强度干涉学, 相干因子

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1 引 言

强度干涉 [1−35] 和集合流 [36−43] 是探测粒子 – 粒子、粒子 – 核和核 – 核碰撞所产生物质特性及动力学性质 (例如相变) 的强有力工具. 我们的论文和其他人的论文对单源和多源强度干涉学进行了广泛的研究 [1−35]. 本文给出了两种统计系综下相对论重离子碰撞中部分相干源的相干因子的表达式.

2 两种统计系综下部分相干源的相干因子

与一个部分相干源对应的第一种统计系综为

$$|\eta_{pc}\rangle = \exp\Big\{\int \mathrm{d}\boldsymbol{p}\mathrm{d}t\eta(\boldsymbol{p},t)[\gamma(t) + \phi(t)]\exp(\mathrm{i}E_p t)c^+(\boldsymbol{p})\Big\}\Big|0\Big\rangle, \tag{1}$$

这里 $\phi(t)$ 为相干源的相因子

$$\langle\gamma(t)\phi(t')\rangle = 0, \tag{2}$$

$$\langle\gamma^*(t)\phi(t')\rangle = 0, \tag{3}$$

$$\phi^*(t)\phi(t') = B(t,t'), \tag{4}$$

定义

$$L(\boldsymbol{p},t) = \exp(\mathrm{i}E_p t)\eta(\boldsymbol{p},t), \tag{5}$$

我们有

$$C_2(\boldsymbol{p}_1,\boldsymbol{p}_2) = 1 + \frac{A(\boldsymbol{p}_1,\boldsymbol{p}_2) + D(\boldsymbol{p}_1,\boldsymbol{p}_2)}{P(\boldsymbol{p}_1)P(\boldsymbol{p}_2)}, \tag{6}$$

这里

$$A(\boldsymbol{p}_1,\boldsymbol{p}_2) = \Big|\int L^*(\boldsymbol{p}_1,t)L(\boldsymbol{p}_2,t)\mathrm{d}t\Big|^2, \tag{7}$$

$$D(\boldsymbol{p}_1,\boldsymbol{p}_2) = M(\boldsymbol{p}_1,\boldsymbol{p}_2) + M^*(\boldsymbol{p}_1,\boldsymbol{p}_2), \tag{8}$$

$$M(\boldsymbol{p}_1,\boldsymbol{p}_2) = \Big(\int L^*(\boldsymbol{p}_1,t)L(\boldsymbol{p}_2,t)\mathrm{d}t\Big) \times \Big(\int L^*(\boldsymbol{p}_2,t)L(\boldsymbol{p}_1,t') \times B(t,t')\mathrm{d}t\mathrm{d}t'\Big), \tag{9}$$

$$P(\boldsymbol{p}) = \Big|\int L(\boldsymbol{p},t)\mathrm{d}t|^2 + \int L^*(\boldsymbol{p},t) \times L(\boldsymbol{p},t')B(t,t')\mathrm{d}t\mathrm{d}t', \tag{10}$$

因而对应统计系综 (1) 式的部分相干源的相干因子为

$$\lambda_P = \frac{A(\boldsymbol{p},\boldsymbol{p}) + D(\boldsymbol{p},\boldsymbol{p})}{[P(\boldsymbol{p})]^2}, \tag{11}$$

与部分相干源对应的第二种统计系综为

$$\rho_E = \sum_{N=1}^{\infty} P_S(N)\int \mathrm{d}z_1 F(z_1)\cdots\mathrm{d}z_N F(z_N) |j\rangle\langle j|, \tag{12}$$

这里 $F(z)$ 为源密度分布函数, 而

$$|j\rangle = \mathrm{e}^{-\bar{n}/2}\exp\Big(\mathrm{i}\int \mathrm{d}\boldsymbol{p}j(\boldsymbol{p})a^+(\boldsymbol{p})\Big)|0\rangle. \tag{13}$$

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当

$$j(p)=\sum_{i=1}^{N}\exp(\mathrm{i}px_i)[\exp(\mathrm{i}\phi_i)j_{0ch}(y-y_i,p_T)+\exp(\mathrm{i}\phi_0)j_{0co}(y-y_i,p_T)] \quad (14)$$

时, 单粒子分布概率为

$$P_1(p)=H_1(p)+H_2(p)+H_3(p), \quad (15)$$

这里

$$H_1(p)=\langle N\rangle\int \mathrm{d}y_0\tilde{F}(0,y_0)\times|j_{0ch}(y-y_0,p_T)|^2, \quad (16)$$

$$H_2(p)=\langle N\rangle\int \mathrm{d}y_0\tilde{F}(0,y_0)\times|j_{0co}(y-y_0,p_T)|^2, \quad (17)$$

$$H_3(p)=\langle N(N-1)\rangle|\int \mathrm{d}y_0\tilde{F}(p,y_0)\times j_{0co}(y-y_0,p_T)|^2. \quad (18)$$

双粒子分布概率为

$$P_2(p_1,p_2)=\sum_{m=1}^{4}\sum_{n=1}^{4}E_{mn}, \quad (19)$$

这里

$$E_{mn}=\langle L_m(p_1)L_n(p_2)\rangle, \quad (20)$$

$$L_1(p)=\sum_{i=1}^{N}\sum_{j=1}^{N}\exp[\mathrm{i}(\phi_i-\phi_j)]\times\exp[\mathrm{i}p(x_i-x_j)]j_{0ch}(y-y_i,p_T)\times j_{0ch}^*(y-y_0,p_T), \quad (21)$$

$$L_2(p)=\sum_{i=1}^{N}\sum_{j=1}^{N}\exp[\mathrm{i}(\phi_i-\phi_0)]\times\exp[\mathrm{i}p(x_i-x_j)]j_{0ch}(y-y_i,p_T)\times j_{0co}^*(y-y_0,p_T), \quad (22)$$

$$L_3(p)=[L_2(p)]^*, \quad (23)$$

$$L_1(p)=\sum_{i=1}^{N}\sum_{j=1}^{N}\exp[\mathrm{i}p(x_i-x_j)]\times j_{0co}(y-y_i,p_T)\times j_{0co}^*(y-y_0,p_T), \quad (24)$$

$$E_{11}=E_{11a}+E_{11b}+E_{11c}, \quad (25)$$

$$E_{11a}=\langle N\rangle\Big[\int\tilde{F}(0,y_0)|j_{0ch}(y_1-y_0,p_{T1})|^2\times|j_{0ch}(y_2-y_0,p_{T2})\mathrm{d}y_0|^2, \quad (26)$$

$$E_{11b}=\langle N(N-1)\rangle\Big[\int\tilde{F}(0,y_0)\times|j_{0ch}(y_1-y_0,p_{T1})|^2\mathrm{d}y_0\Big]\times\Big[\int\tilde{F}(0,y_0)|j_{0ch}(y_2-y_0,p_{T2})|^2\times\mathrm{d}y_0\Big], \quad (27)$$

$$E_{11c}=\langle N(N-1)\rangle|\int\tilde{F}(p_1-p_2)j_{0ch}\times(y_1-y_0,p_{T1})\times j_{0ch}^*(y_2-y_0,p_{T2})\mathrm{d}y_0|^2, \quad (28)$$

$$E_{12}=0, \quad (29)$$

$$E_{13}=0, \quad (30)$$

$$E_{14}=E_{14a}+E_{14b}+E_{14c}+E_{14d}+E_{14e}, \quad (31)$$

$$E_{14a}=\langle N(N-1)(N-2)\rangle\Big[\int\tilde{F}(0,y_0)\times|j_{0ch}(y_1-y_0,p_{T1})|^2\mathrm{d}y_0\Big]\times\Big[|\int\tilde{F}(p_2,y_0)\times j_{0co}(y_2-y_0,p_{T2})\mathrm{d}y_0|^2\Big], \quad (32)$$

$$E_{14b}=\langle N(N-1)\rangle\Big[\int\tilde{F}(0,y_0)\times|j_{0ch}(y_1-y_0,p_{T1})|^2\mathrm{d}y_0\Big]\times\Big[\int\tilde{F}(0,y_0)|j_{0co}(y_2-y_0,p_{T2})|^2\times\mathrm{d}y_0\Big], \quad (33)$$

$$E_{14c}=\langle N(N-1)\rangle\Big[\int\tilde{F}(p_2,y_0)\times|j_{0ch}(y_1-y_0,p_{T1})|^2\times j_{0co}(y_2-y_0,p_{T2})\mathrm{d}y_0\Big]\times\Big[\int\tilde{F}^*(p_2,y_0)j_{0co}^*(y_2-y_0,p_{T2})\times\mathrm{d}y_0\Big], \quad (34)$$

$$E_{14d}=\langle N(N-1)\rangle\Big[\int\tilde{F}^*(p_2,y_0)\times|j_{0ch}(y_1-y_0,p_{T1})|^2\times j_{0co}^*(y_2-y_0,p_{T2})\mathrm{d}y_0\Big]\times\Big[\int\tilde{F}(p_2,y_0)j_{0co}(y_2-y_0,p_{T2})\times\mathrm{d}y_0\Big], \quad (35)$$

$$E_{14e}=\langle N\rangle\Big[\int\tilde{F}(0,y_0)|j_{0ch}(y_1-y_0,p_{T1})|^2$$

$$\times |j_{0co}(y_2 - y_0, p_{T2})|^2 \mathrm{d}y_0, \quad (36)$$

$$E_{21} = 0, \quad (37)$$

$$E_{22} = 0, \quad (38)$$

$$E_{23} = E_{23a} + E_{23b} + E_{23c} + E_{23d} + E_{23e}, \quad (39)$$

$$E_{23a} = \langle N \rangle \int \tilde{F}(0, y_0) j_{0ch}(y_1 - y_0, p_{T1}) \times j^*_{0co}(y_1 - y_0, p_{T1}) \times j^*_{0ch}(y_2 - y_0, p_{T2}) \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0, \quad (40)$$

$$E_{23b} = \langle N(N-1) \rangle \Big[\int \tilde{F}^*(p_2, y_0) \times j_{0ch}(y_1 - y_0, p_{T1}) \times j^*_{0co}(y_1 - y_0, p_{T1}) \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}(p_2, y_0) j^*_{0ch}(y_2 - y_0, p_{T2}) \times \mathrm{d}y_0 \Big], \quad (41)$$

$$E_{23c} = \langle N(N-1) \rangle \Big[\int \tilde{F}(p_1, y_0) \times j_{0ch}(y_1 - y_0, p_{T1}) \times j^*_{0ch}(y_2 - y_0, p_{T2}) \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}^*(p_1, y_0) \times j^*_{0co}(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big], \quad (42)$$

$$E_{23d} = \langle N(N-1) \rangle \Big[\int \tilde{F}(p_1 - p_2, y_0) \times j_{0ch}(y_1 - y_0, p_{T1}) \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}^*(p_1 - p_2, y_0) \times j^*_{0co}(y_1 - y_0, p_{T1}) \times j^*_{0ch}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big], \quad (43)$$

$$E_{23e} = \langle N(N-1)(N-2) \rangle \times \Big[\int \tilde{F}(p_1 - p_2, y_0) j_{0ch}(y_1 - y_0, p_{T1}) \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}^*(p_1, y_0) j^*_{0co}(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}(p_2, y_0) j^*_{0co}(y_2 - y_0, p_{T2}) \times \mathrm{d}y_0 \Big], \quad (44)$$

$$E_{24} = 0, \quad (45)$$

$$E_{31} = 0, \quad (46)$$

$$E_{32} = (E_{23})^*, \quad (47)$$

$$E_{33} = 0, \quad (48)$$

$$E_{34} = 0, \quad (49)$$

$$E_{41} = E_{41a} + E_{41b} + E_{41c} + E_{41d} + E_{41e}, \quad (50)$$

$$E_{41a} = \langle N \rangle \Big[\int \tilde{F}(0, y_0) |j_{0co}(y_1 - y_0, p_{T1})|^2 \times |j_{0ch}(y_2 - y_0, p_{T2})|^2 \mathrm{d}y_0 \Big], \quad (51)$$

$$E_{41b} = \langle N \rangle \Big[\int \tilde{F}(0, y_0) \times |j_{0co}(y_1 - y_0, p_{T1})|^2 \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}(0, y_0) |j_{0ch}(y_2 - y_0, p_{T2})|^2 \times \mathrm{d}y_0 \Big], \quad (52)$$

$$E_{41c} = \langle N(N-1) \rangle \Big[\int \tilde{F}(p_1, y_0) \times j_{0co}(y_1 - y_0, p_{T1}) \times |j_{0ch}(y_2 - y_0, p_{T2})|^2 \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}(p_1, y_0) j^*_{0co}(y_1 - y_0, p_{T1}) \times \mathrm{d}y_0 \Big], \quad (53)$$

$$E_{41d} = \langle N(N-1) \rangle \Big[\int \tilde{F}(p_1, y_0) \times j_{0co}(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}^*(p_1, y_0) j^*_{0co}(y_1 - y_0, p_{T1}) \times |j_{0ch}(y_2 - y_0, p_{T2})|^2 \mathrm{d}y_0 \Big], \quad (54)$$

$$E_{41e} = \langle N(N-1)(N-2) \rangle \Big[\int \tilde{F}(p_1, y_0) \times j_{0co}(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}^*(p_1, y_0) j^*_{0co}(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \times \Big[\int \tilde{F}(0, y_0) |j_{0ch}(y_2 - y_0, p_{T2})|^2 \times \mathrm{d}y_0 \Big], \quad (55)$$

$$E_{42} = 0, \quad (56)$$

$$E_{43} = 0, \tag{57}$$

$$\begin{aligned} E_{44} = & E_{44a} + E_{44b} + E_{44c} + E_{44d} + E_{44e} \\ & + E_{44f} + E_{44g} + E_{44h} + E_{44i} + E_{44j} \\ & + E_{44k} + E_{44l} + E_{44m} \\ & + E_{44n} + E_{44o}, \end{aligned} \tag{58}$$

$$\begin{aligned} E_{44a} = & \langle N \rangle \Big[\int \tilde{F}(0, y_0) \\ & \times |j_{0co}(y_1 - y_0, p_{T1})|^2 \\ & \times |j_{0co}(y_2 - y_0, p_{T2})|^2 \mathrm{d}y_0 \Big], \end{aligned} \tag{59}$$

$$\begin{aligned} E_{44b} = & \langle N(N-1) \rangle \Big[\int \tilde{F}(p_1, y_0) \\ & \times j_{0co}(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}^*(p_1, y_0) j_{0co}^*(y_1 - y_0, p_{T1}) \\ & \times |j_{0co}(y_2 - y_0, p_{T2})|^2 \mathrm{d}y_0 \Big], \end{aligned} \tag{60}$$

$$\begin{aligned} E_{44c} = & \langle N(N-1) \rangle \Big[\int \tilde{F}^*(p_1, y_0) \\ & \times j_{0co}^*(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}(p_1, y_0) j_{0co}(y_1 - y_0, p_{T1}) \\ & \times |j_{0co}(y_2 - y_0, p_{T2})|^2 \mathrm{d}y_0 \Big], \end{aligned} \tag{61}$$

$$\begin{aligned} E_{44d} = & \langle N(N-1) \rangle \Big[\int \tilde{F}(p_2, y_0) \\ & \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}^*(p_2, y_0) j_{0co}^*(y_2 - y_0, p_{T2}) \\ & \times |j_{0co}(y_1 - y_0, p_{T1})|^2 \mathrm{d}y_0 \Big], \end{aligned} \tag{62}$$

$$\begin{aligned} E_{44e} = & \langle N(N-1) \rangle \Big[\int \tilde{F}^*(p_2, y_0) \\ & \times j_{0co}^*(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}(p_2, y_0) j_{0co}(y_2 - y_0, p_{T2}) \\ & \times |j_{0co}(y_1 - y_0, p_{T1})|^2 \mathrm{d}y_0 \Big], \end{aligned} \tag{63}$$

$$\begin{aligned} E_{44f} = & \langle N(N-1) \rangle \Big[\int \tilde{F}(0, y_0) \\ & \times |j_{0co}(y_1 - y_0, p_{T1})|^2 \\ & \times |j_{0co}(y_2 - y_0, p_{T2})|^2 \mathrm{d}y_0 \Big], \end{aligned} \tag{64}$$

$$\begin{aligned} E_{44g} = & \langle N(N-1) \rangle \Big\{ \int \tilde{F}(p_1 + p_2, y_0) \\ & \times [j_{0co}(y_1 - y_0, p_{T1})]^2 \mathrm{d}y_0 \Big\} \\ & \times \Big\{ \int \tilde{F}^*(p_1 + p_2, y_0) \\ & \times [j_{0co}^*(y_1 - y_0, p_{T1})]^2 \mathrm{d}y_0 \Big\}, \end{aligned} \tag{65}$$

$$\begin{aligned} E_{44h} = & \langle N(N-1) \rangle \Big[\int \tilde{F}(0, y_0) j_{0co}(y_1 \\ & - y_0, p_{T1}) j_{0co}^*(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}^*(0, y_0) j_{0co}^*(y_1 - y_0, p_{T1}) \\ & \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big], \end{aligned} \tag{66}$$

$$\begin{aligned} E_{44i} = & \langle N(N-1)(N-2) \rangle \Big[\int \tilde{F}(0, y_0) \\ & \times |j_{0co}(y_1 - y_0, p_{T1}|^2 \Big] \\ & \times \Big[\int \tilde{F}(p_2, y_0) j_{0co}^*(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}^*(p_2, y_0) j_{0co}(y_2 - y_0, p_{T2}) \\ & \times \mathrm{d}y_0 \Big], \end{aligned} \tag{67}$$

$$\begin{aligned} E_{44j} = & \langle N(N-1)(N-2) \rangle \Big[\int \tilde{F}(p_1 \\ & + p_2, y_0) j_{0co}(y_1 - y_0, p_{T1}) \\ & \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}^*(p_1, y_0) j_{0co}^*(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}^*(p_2, y_0) \\ & \times j_{0co}^*(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big], \end{aligned} \tag{68}$$

$$\begin{aligned} E_{44k} = & \langle N(N-1)(N-2) \rangle \Big[\int \tilde{F}(p_1 \\ & - p_2, y_0) j_{0co}(y_1 - y_0, p_{T1}) \\ & \times j_{0co}^*(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}^*(p_1, y_0) j_{0co}^*(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}(p_2, y_0) j_{0co}(y_2 - y_0, p_{T2}) \\ & \times \mathrm{d}y_0 \Big], \end{aligned} \tag{69}$$

$$\begin{aligned} E_{44l} = & \langle N(N-1)(N-2) \rangle \Big[\int \tilde{F}^*(p_1 \\ & - p_2, y_0) j_{0co}^*(y_1 - y_0, p_{T1}) \\ & \times j_{0co}(y_2 - y_0, p_{T2}) \mathrm{d}y_0 \Big] \\ & \times \Big[\int \tilde{F}(p_1, y_0) j_{0co}(y_1 - y_0, p_{T1}) \mathrm{d}y_0 \Big] \end{aligned}$$

$$\times\Big[\int \tilde{F}^*(p_2,y_0)j^*_{0co}(y_2-y_0,p_{T2}) \times \mathrm{d}y_0\Big], \tag{70}$$

$$\begin{aligned}E_{44m}=&\langle N(N-1)(N-2)\rangle\Big[\int \tilde{F}^*(p_1+p_2,y_0)j^*_{0co}(y_1-y_0,p_{T1})\\&\times j^*_{0co}(y_2-y_0,p_{T2})\mathrm{d}y_0\Big]\\&\times\Big[\int \tilde{F}(p_1,y_0)j_{0co}(y_1-y_0,p_{T1})\mathrm{d}y_0\Big]\\&\times\Big[\int \tilde{F}(p_2,y_0)j_{0co}(y_2-y_0,p_{T2})\\&\times \mathrm{d}y_0\Big],\end{aligned} \tag{71}$$

$$\begin{aligned}E_{44n}=&\langle N(N-1)(N-2)\rangle\Big[\int \tilde{F}(0,y_0)\\&\times |j_{0co}(y_2-y_0,p_{T2}|^2\Big]\\&\times\Big[\int \tilde{F}(p_1,y_0)j_{0co}(y_1-y_0,p_{T1})\mathrm{d}y_0\Big]\\&\times\Big[\int \tilde{F}^*(p_1,y_0)j^*_{0co}(y_1-y_0,p_{T1})\\&\times \mathrm{d}y_0\Big],\end{aligned} \tag{72}$$

$$\begin{aligned}E_{44o}=&\langle N(N-1)(N-2)(N-3)\rangle\\&\times\Big[\Big|\int \tilde{F}(p_1,y_0)j_{0co}(y_1-y_0,p_{T1})\mathrm{d}y_0\Big|^2\Big]\\&\times\Big[\Big|\int \tilde{F}(p_2,y_0)j_{0co}(y_2-y_0,p_{T2})\\&\times \mathrm{d}y_0\Big|^2\Big],\end{aligned} \tag{73}$$

因而对应统计系综 (12) 式的部分相干源的相干因子为

$$\lambda_G=\frac{P_2(p,p)}{[P_1(p)]^2}-1. \tag{74}$$

3 结 论

本文中给出了两种统计系综下相对论重离子碰撞中部分相干源的相干因子的表达式. 从表达式可以看出, 相干因子与源的密度分布和产生粒子的流有关.

[1] Gyulassy M, Kauffmann S K, Wilson L W 1979 *Phys. Rev.* C **20** 2267

[2] Pratt S 1984 *Phys. Rev. Lett.* **53** 1219

[3] Abelev B I (STAR Collaboration) 2010 *Phys. Rev.* C **81** 024911

[4] Abelev B I (STAR Collaboration) 2009 *Phys. Rev.* C **80** 024905

[5] Alexander G 2003 *Rep. Prog. Phys.* **66** 481

[6] Tannenbaum M J 2006 *Rep. Prog. Phys.* **69** 2005

[7] Frodermann E, Heinz U 2009 *Phys. Rev.* C **80** 044903

[8] Weiner R M 2000 *Phys. Rep.* **327** 249

[9] Wiedemann U A, Heinz U 1999 *Phys. Rep.* **319** 145

[10] Boal D H, Gelbke C K, Jennings B K 1990 *Rev. Mod. Phys.* **62** 553

[11] Zajc W A, J A Bistirlich, Bossingham R R 1984 *Phys. Rev.* C **29** 2173

[12] Pratt S 2005 arXiv: 0511010 [nucl-th]

[13] Csörgö T 2005 arXiv: 0505019 [nucl-th]

[14] Pratt S 2009 *Phys. Rev. Lett.* **102** 232301

[15] Florkowski W, Broniowski W, Chojnacki M 2009 *J. Phys.* G **36** 064067

[16] Wong C Y, Zhang W N 2007 *Phys. Rev.* C **76** 034905

[17] Pratt S 1992 *Pyhs. Rev. Lett.* **68** 1109

[18] Zhang W N, Effaf M J, Wong C Y 2004 *Phys. Rev.* C **70** 024903

[19] Bozek P 2011 *Phys. Rev.* C **83** 044910

[20] Chen X F, Yang X D, Chen Z L 2011 *Communications in Theoretical Physics* **55** 640

[21] Chen X F, Yang X D, Han L 2004 *Chin. Phys.* **13** 341

[22] Chen X F, Yang X D, Chen Z L 2001 *Chin. Phys. Lett.* **18** 1452

[23] Chen X F 2007 *High Energy Physics and Nuclear Physics* **31** 173 (in Chinese) [陈小凡 2007 高能物理与核物理 **31** 173]

[24] Chen X F, Yang X D, Han L 2007 *High Energy Physics and Nuclear Physics* **30** 44 (in Chinese) [陈小凡, 杨学栋, 韩玲 2006 高能物理与核物理 **30** 44]

[25] Chen X F, Yang X D, Cheng Z L 2002 *High Energy Physics and Nuclear Physics* **26** 955 (in Chinese) [陈小凡, 杨学栋, 陈志来 2002 高能物理与核物理 **26** 955]

[26] Chen X F, Cheng X F, Cheng Z L, Yang X D 2002 *High Energy Physics and Nuclear Physics* **26** 383 (in Chinese) [陈小凡, 陈志来, 杨学栋 2002 高能物理与核物理 **26** 383]

[27] Chen X F, Chen Z L, Yang X D 2001 *High Energy Physics and Nuclear Physics* **25** 1002 (in Chinese) [陈小凡, 陈志来, 杨学栋 2001 高能物理与核物理 **25** 1002]

[28] Chen X F, Chen Z L, Yang X D 2001 *High Energy Physics and Nuclear Physics* **25** 149 (in Chinese) [陈小凡, 陈志来, 杨学栋 2001 高能物理与核物理 **25** 149]

[29] Chen X F, Chen Z L, Yang X D 2000 *High Energy Physics and Nuclear Physics* **24** 524 (in Chinese) [陈小凡, 陈志来, 杨学栋 2000 高能物理与核物理 **24** 524]

[30] Chen X F, Chen Z L 1999 *High Energy Physics and Nuclear Physics* **23** 1097 (in Chinese) [陈小凡, 陈志来 1999 高能物理与核物理 **23** 1097]

[31] Chen X F 1998 *High Energy Physics and Nuclear Physics* **22** 903 (in Chinese) [陈小凡 1998 高能物理与核物理 **22** 903]

[32] Chen X F 1998 *High Energy Physics and Nuclear Physics* **22** 424 (in Chinese) [陈小凡 1998 高能物理与核物理 **22** 424]

[33] Chen X F, Yang X D, Chen Z L 2004 *J. Harbin Institute of Tech-

nology **36** 1693(in Chinese) [陈小凡, 杨学栋, 陈志来 2004 哈尔滨工业大学学报 **36** 1693]

[34] Chen X F, Yang X D, Chen Z L 2003 *J. Harbin Institute of Technology* **31** 173 (in Chinese) [陈小凡, 杨学栋, 陈志来 2003 哈尔滨工业大学学报 **35** 379]

[35] Chen X F, Chen Z L, Yang X D 2002 *J. Harbin Institute of Technology* **31** 173 (in Chinese) [陈小凡, 陈志来, 杨学栋 2002 哈尔滨工业大学学报 **34** 258]

[36] Danielewicz P, Lacey R P, Gossiaux P B 1998 *Phys. Rev. Lett.* **81** 2438

[37] Chkhaidze L, Danielewitz P, Djobava T 2009 *Nucl. Phys.* A **831** 22

[38] Chkhaidze L, Danielewitz P, Djobava T 2009 *Nucl. Phys.* A **794** 115

[39] Sorge H 1999 *Phys. Rev. Lett.* **82** 2048

[40] Shen C, Heinz U, Huovinen P 2010 *Phys. Rev.* C **82** 054904

[41] Adare A (PHENIX Collaboration) 2010 *Phys. Rev. Lett.* **105** 062301

[42] E895 Collaboration, C.Pinkenburg, N.N. Ajitanand, J.M. Alexander 1999 *Phys. Rev. Lett.* **83** 1295

[43] Wang S, Liu Y M, Jiang Y Z 1990 *High Energy Physics and Nuclear Physics* **14** 907 (in Chinese) [王山, 刘亦铭, 蒋玉桢 1990 高能物理与核物理 **14** 907

Coherence parameters of partially chaotic sources in relativistic heavy-ion collisions

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Abstract

The coherence parameters of partially chaotic pion sources in relativistic heavy-ion collisions for two statistical ensembles are given.

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