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Flow Production Rate of Hard Photons Probes of Quark–Anti Quark Annihilation Processes at Plasma Phase

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Abstract: The flow emission rate of hard photons from lowest order the QCD processes for quark-anti quark annihilation processes in plasma media at high temperatures (175, 200, 225, 250 and 275 MeV) have been study. In these framework photons, the flow photons emission is calculate according to quark-antiquark annihilation using the quantum chromodynamic theory and solves the ultrarelativistic equation with MATLAP program. Due to the results, we show increases flow photons rate with increases strength coupling and increases with increases temperature of media, it indicate that logarithmically divergent thermal effect on photons product. The critical temperature (T_c=155 to 195 MeV) effect on the quarks confined in hadronic matter phase, it is important parameter effect on strength coupling with flavour number. The flow photons rate spectra show decreasing with increasing th photons energy, it indicate the processes at hadronic phase.
Key Word: Flow Production Rate, Hard Photons, Quark–Anti Quark.

1. Introduction

In recent years, the study of behavior photon has produced at relativistic heavy ion collisions was gained momentum due to experimental results data from SPS, CERN and data from RHIC experiments at BNL [1]. In view of the relativistic heavy-ion collision (RHIC) and large hadron collider (LHC) experiments have realized forcedly quark -gluon plasma coupled (QGP) [2] and investigated the interacting using QCD equations of state [3]. Photon has been used a valuable probing of the quark gluon plasma matter that's created in heavy-ion collisions experiment [4]. The photons have been produced by Compton scattering processes at interaction $qg \rightarrow \gamma q$ system and annihilation processes for $q\bar{q} \rightarrow \gamma g$ system produce at one loop appear in the perturbative of the HTL effective theory [5]. The Standard Model is one of the best quantum field theory to describe the quark gluon interaction in plasma media [6]. The Standard Model has two theory electroweak theory and quantum chromodynamics theory. The quantum chromodynamics theory QCD is the theory describe a strong quark gluon plasma interaction [7]. Quantum chromodynamics theory is relativistic a gauge theory supported us the basic dynamics between quarks and gluons and discussion the nature of strong nuclear interaction between them. It is fundamental colour forces describe the interactions between quarks and gluons system in hadrons [8]. The standered model investigated the quarks to six type increasing of mass from $m_{up} = 2.3^{+0.7}_{-0.5}$ MeV to $m_{top} = 160000^{+5000}_{-4000} GeV$, there are called ; up, down, strange, charm, bottom, and top. On the other hand, there are six anti-quarks have same properties of quarks except charge.Quarks have spin 1 \2 mediated by each other by particle called gluon, its boson has spin [9].

Since the quark-gluon, plasma deconfined was predicted in ultrarelativistic nuclear collisions many efforts had been done to explore it. The quark-gluon plasma has existed only for several Fermi time in a about 100 fm3 volume [10]. The photons are produced rates have been calculated completely using strength coupling for a quark-gluon plasma in thermal equilibrium. The photons rates evaluate at one loop [11]. The hard photons production in colliding hadrons reactions of was calculated using bosons distributions by structure functions and using strength coupling [12].In this paper, we discussion and estimation the flow photons rate at two system of quark – anti quark annihilation processes using the quantum chromodynamic theory.

2. Theory

The photons rate refers to number of photons that's emition per unit time per unit volume of the plasma for real photons. Photons rate at temperature T and the photon mission energy E_γ are given by the following formula [13, 14].

$$E_\gamma \frac{dR_\gamma}{d^3E} = \frac{-1}{(2\pi)^3} \mathrm{F_B} \, \mathrm{Im} \prod_{ret}^{\mu-\vartheta}\left(E_\gamma,\ T\right) \quad (1)$$

Where $\mathrm{Im} \prod_{ret}^{\mu-\vartheta}\left(E_\gamma,\ T\right)$is the imaginary of self-photons energy propagation, $E_\gamma$is the photons energy, T is the temperature of system and $\mathrm{F_B}$ is distribution function [10, 15]

$$\mathrm{F_B} = \left(e^{E_\gamma/T} \pm 1\right)^{-1} = \begin{cases} \left(e^{\frac{E_\gamma}{T}} + 1\right)^{-1} & for\ Fermionic \\ \left(e^{\frac{E_\gamma}{T}} - 1\right)^{-1} & for\ Bosonic \end{cases} \quad (2)$$

The self-photons energy propagation for one loop can be written as [16].

$$\mathrm{Im} \prod_{ret}^{\mu-\vartheta}\left(E_\gamma,\ T\right) = \frac{1}{2}\left[e^{\frac{E}{T}} - 1\right] e^2 e_Q^2 N_C \int \frac{d^4Q}{(2\pi)^4} Tr[\sigma^\mu(q) I^* S^- \sigma_\mu S^+ + \sigma^\mu(q) I^* S^- \sigma_\mu I^* S^+] \quad (3)$$

Where N_C is the color number, Tr is trace, e^2 is square of strength structure, e_Q^2 is square of quark charge, σ^μ is propagation function I^*S^- is pole of gluon function. The propagation function is written as[17].

$$I^*S^{-\pm} = 2\left[\partial(\pm q^o) - n_f(q^o)\right] Re\left(\frac{i}{q^o - \sum q + i\varepsilon}\right) \quad (4)$$

Where q^o is the photons energy parameter and ε is residual of energy for quark gluon interaction. The real tem for hard photons is [18].

$$Re\left(\frac{i}{q^o - \sum q + i\varepsilon}\right) = \frac{1}{2}(\exists^o - \exists.q) Im\, \frac{1}{D_+(q^o, q))} + \frac{1}{2}(\exists^o + \exists.q) Im\, \frac{1}{D_-(q^o, q))} \quad (5)$$

Where $\exists^o$ and $\exists$ are the operator of propagation and $D_\pm$ are the density operators.
The excitation mode for quark gluon determined by [16]

$$D_\pm(q^o,\ q) = -q^o \pm q + \frac{m_q^2}{2q}\left[\left(1 \mp \frac{q^o}{q}\right) Ln\left(\frac{q^o + q}{q^o - q}\right) \pm 2\right] \quad (6)$$

The mass of quark induced by QCD temperature by formula [19].

$$m_q^2 = \frac{g^2 C_f T^2}{8} = \frac{2\pi}{3}\alpha^{St} T^2 \approx 2\pi\alpha^{St} T^2 \quad (7)$$

Substituting the Eq.(6), Eq.(5) and Eq.(3) in Eq.(1) and solving mathematically to results.

$$E_\gamma \frac{dR_\gamma}{d^3E} \approx \frac{e_Q^2 \alpha^{cals}}{\pi^2} N_C e^{-\frac{E}{T}} \frac{1}{\pi} \int_0^{q^*} q dq \frac{1}{\pi} \int_{-q}^{+q} dq^o \epsilon(q^o) \left[\left(1 - \frac{q^o}{q}\right) Im\, \frac{1}{D_+(q^o, q))} + \left(1 + \frac{q^o}{q}\right) Im\, \frac{1}{D_-(q^o, q))}\right] \quad (8)$$

That the $Im\, \frac{1}{D_\pm(q^o, q))}$ is limited the quark propagation depending on the functions $D_\pm$ for small space, for the static limit $q \sim 0$ then imaginary inverse function $D_\pm$is given by [16].

$$Im\ \frac{1}{D_\pm} \approx \frac{1}{q^2+m_q^2(\pi^2+4)/8} \tag{9}$$

However, for the quasi-particle modes ω the Eq, (8) can be easily written using Dirac delta function using [16].

$$Im\ \frac{1}{D_\pm(\omega,q))} = \frac{\pi}{2m_q^2}\left(\omega_\pm^2 - q^2\right)\delta(\omega-\omega_\pm) \tag{10}$$

The frequencies $\omega_\pm$ can estimation by.

$$D_\pm(\omega,\ q)) = 0 \tag{11}$$

Then.

$$\int_{-q}^{+q} \epsilon(q^o) Im\ \frac{1}{D_+(q^o,q))}(1-\frac{q^o}{q})dq^o = 0 \tag{12}$$

The Eq.(8) with Eq.(10) and for soft term becomes.

$$E_\gamma \frac{dR_\gamma}{d^3E} \approx \frac{e_Q^2\alpha^{clas}}{\pi^2} N_C e^{-\frac{E}{T}} \int_0^{q^*} \frac{\pi}{2m_f^2}\left(\omega_\pm^2 - q^2\right)\delta(\omega-\omega_\pm)dq \tag{13}$$

$\mathbb{F}_q(\omega)$ and $\mathbb{F}_g(\omega^\sim)$ are the Jouttner distribution functions. for quarks, and gluons and may be written as by [10].

$$E_\gamma \frac{dR_\gamma}{d^3E} \approx \frac{e_Q^2\alpha^{clas}}{\pi^2} N_C e^{-\frac{E}{T}} \int_0^{q^*} (\mathbb{F}^2{}_q(\omega)-1)\mathbb{F}_g(\omega^\sim)\frac{\pi}{2m_f^2}\left(\omega_\pm^2 - q^2\right)\delta(\omega-\omega_\pm)dq \tag{14}$$

The Eq.(13) simply to.

$$E_\gamma \frac{dR_\gamma}{d^3E} \approx \frac{e_Q^2\alpha^{clas}}{\pi^2} N_C e^{-\frac{E}{T}} \frac{1}{m_f^2}(\mathbb{F}^2{}_q(\omega)-1)\mathbb{F}_g(\omega^\sim)\int_0^{q^*}[(\omega_+ - q)(\omega_+^2 - q^2) - (\omega_- + q)(\omega_-^2 - q^2)]dq \tag{15}$$

The Jouttner distribution for both quarks and gluons $f_q(\omega)$ and $f_g(\omega^\sim)$ are written as by [20].

$$f_q(\omega) = \frac{\lambda_Q}{e^{\frac{E_q}{T}}+1},\ \ and\ f_g(\omega^\sim) = \frac{\lambda_G}{e^{\frac{E_g}{T}}-1} \tag{16}$$

whereλ_Q and λ_G are the fugacity of quark and gluon respectively. However, the function distribution for both quark and gluon at larger than photon energy, $E_q + E_g > E_\gamma \gg T$ make assume that.

$$e^{\frac{E_q}{T}} + 1 \approx 1 \text{ and } e^{\frac{E_g}{T}} - 1 \approx 1 \tag{17}$$

Then under this limit, we can approximation to replace.

$$(\mathbb{F}^2{}_q(\omega)-1)\mathbb{F}_g(\omega^\sim) = ({\lambda_Q}^2-1)\lambda_G \approx^{{\lambda_Q}^2\lambda_G} \tag{18}$$

But from identity.

$$\frac{(\omega_\pm \mp q)(\omega_\pm^2 - q^2)}{m_f^2} = \omega_\pm - q\frac{d\omega_\pm}{dq} \tag{19}$$

Using identity Eq.(19) and Eq.(18) with Eq.(14) and solving to reform.

$$E_\gamma \frac{dR_\gamma}{d^3E} \approx \frac{e_Q^2\alpha^{clas}\alpha^{Str}}{\pi^2} T^2 e^{-\frac{E}{T}} \left[\lambda_q^2\lambda_g\right][(\frac{1}{12}Ln\left(\frac{q^*}{m_f}\right)^2 - 1 + \int_0^{q^*}[2\frac{\omega_+ - \omega_-}{m_f^2} - \frac{2}{q+m_f}]dq \tag{20}$$

Whereλ_q and λ_g are the fugacity of quark and gluon respectively. The Eq.(20) could be broken into two terms and solving to results integral analytically to be obtained [21].

$$E_\gamma \frac{dR_\gamma}{d^3q} = \frac{\alpha^{Str}\alpha^{Clas}}{\pi^2} e_Q^2 T^2 e^{-E_\gamma/T}[2\lambda_q^2\lambda_g \left\{\frac{1}{6} Ln\left(\frac{4E_\gamma T}{k_c^2}\right) + \frac{75}{10000}\right\}] \quad (21)$$

Where α^{Str} is the strength coupling quantum colour and α^{Clas} is classical strength and equally to fine structure $\alpha^{Clas} \approx \frac{1}{137}$ and $e_Q$is the electric charge of the quark. The strength coupling quantum colour of quark and $\alpha^{Str}(P)$ is the quantum coupling calculated using [22-23]

$$\alpha^{Str}(P) = \frac{6\pi}{(33-2n_f)ln(\frac{P}{T_c})} \quad (22)$$

Where $P$is the momentum interaction media, n_f is the flavor number and T_c is the critical temperature of system.

3. Results

The photons flow is very important tool to use a valuable prober of the plasma matter is creation in different heavy-ion collisions. The annihilation processes of quark anti quark interaction is basic processes to produce much more photons. A quantum chromodynamic theory has adapted to investigation the photons flow produce rate at quarks system due to photons energy E_γ, strength coupling quantum colour, critical temperature and fugacity of quark and gluon using a MATLAB program. The photons were emitted from an equilibrated interaction quark anti quark contacts during the quark gluon plasma phase, it is determine according to Eq.(21) on both critical temperature $T_c =$ 155 and 195 MeV and Photons energy $E_\gamma = 0.75$, 1.5, 2.25, 3, 3.75, 4.5 and 5.25 GeV for the two $u\bar{d} \rightarrow \gamma g$and $u\bar{s} \rightarrow \gamma g$ systems within strength coupling quantum color from Eq.(22). Due to the chromodynamic quantum postulate the photons flow production is estimate according to calculate the strength coupling quantum colour by Eq.(22) using the total flavour number 3 for $u\bar{d} \rightarrow \gamma g$and 4 for $u\bar{s} \rightarrow \gamma g$. On the other hand, the electric charge over total quarks is $e_Q^2 = \frac{5}{9}$ for $u\bar{d} \rightarrow \gamma g$ system and $e_Q^2 = \frac{5}{9}$ for $u\bar{s} \rightarrow \gamma g$ system. It also needed to determine the critical temperature of phase system T_c and temperature media region of system are limited in range $175 \leq T \leq 275$ MeV by increasing 25 MeV for any time. The results are shown in table (1). However, the photons flow rate has been calculated according to Eq.(21) for both $u\bar{d} \rightarrow \gamma g$and $u\bar{s} \rightarrow \gamma g$ systemes quarks due to MATLAB program using different temperature media from 175, 200, 225, 250 and 275 Mev for both critical temperature T_c= 155 MeVand T= 195 MeV with photons energy E_γ over range 0.75, 1.5, 2.25, 3, 3.75, 4.5 and 5.25 GeV with strength coupling from table(1) *and* substituting all parameters in Eq.(21) to solved using MATLAP program, results are shown in table(2) and (3) with figures (1), and (2) for$u\bar{d} \rightarrow \gamma g$ system and table (4) and (5) with figure (3) and (4) for $u\bar{s} \rightarrow \gamma g$ quarks systems.

Table 1. Strength coupling quantum colour at T_c =155 MeV and Tc= 195MeV.

Critical Temperature	The $u\bar{d} \rightarrow \gamma g$ system				
	P=1.4 GeV	P=1. 6GeV	P=1. 8GeV	P=2. 0GeV	P=2.2 GeV
155 MeV	0.3172	0.2990	0.2847	0.2729	0.2631
195 MeV	0.3541	0.3316	0.3141	0.2998	0.2881
	The $u\bar{s} \rightarrow \gamma g$ system				
	P=1.4 GeV	P=1. 6GeV	P=1. 8GeV	P=2. 0GeV	P=2.2 GeV
155 MeV	0.3425	0.3229	0.3074	0.2948	0.2842
195 MeV	0.3824	0.3582	0.3392	0.3238	0.3111

Table 2. Result of flow photonic rate $E_\gamma \frac{dR_\gamma}{d^3q}$ in $u\bar{d} \rightarrow \gamma g$ at T_C=155MeV with λ_q=0.02, $\lambda_g = 0.08$

E_γ **Gev**	$E_\gamma \frac{dR_\gamma}{d^3q}(\boldsymbol{GeV^2fm^4})^{-1}$				
	T=175 MeV	T=200 MeV	T=225MeV	T=250 MeV	T=275MeV
	α^{Str}=0.3172	α^{Str}=0.2990	α^{Str}=0.2847	α^{Str}=0.2729	α^{Str}=0.2631
0.75	8.8120E-13	1.7621E-12	3.0659E-12	4.8293E-12	7.0649E-12
1.5	1.7719E-14	6.1540E-14	1.6510E-13	3.6890E-13	7.2060E-13
2.25	2.8890E-16	1.7238E-15	7.0524E-15	2.2108E-14	5.7017E-14
3	4.4159E-18	4.5154E-17	2.8102E-16	1.2329E-15	4.1877E-15
3.75	6.5473E-20	1.1461E-18	1.0840E-17	6.6485E-17	2.9715E-16
4.5	9.5393E-22	2.8570E-20	4.1043E-19	3.5177E-18	2.0677E-17
5.25	1.3744E-23	7.0407E-22	1.5358E-20	1.8388E-19	1.4210E-18

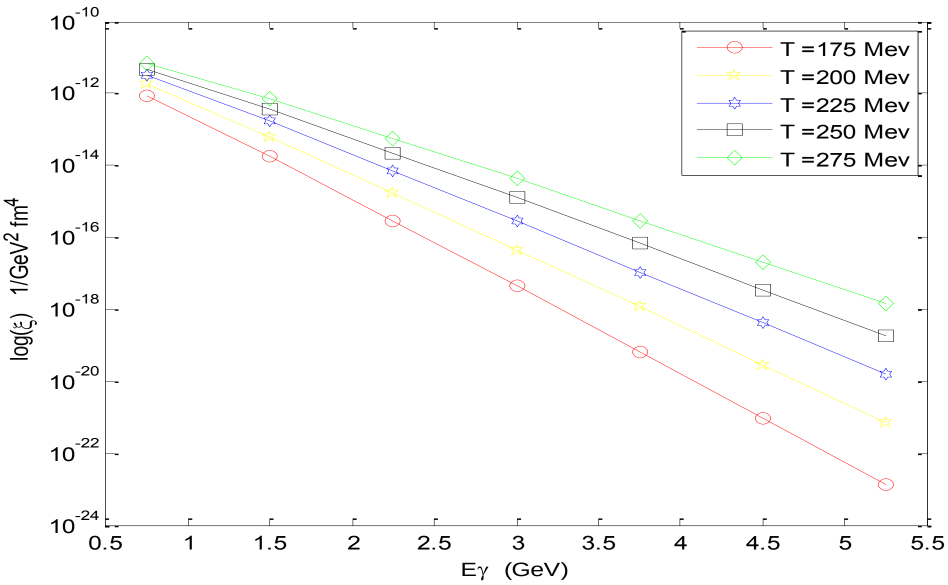

Figure 1. Photon flow rate due to Eγ for $\boldsymbol{u\bar{d}} \rightarrow \boldsymbol{\gamma g}$ system T_c= 155 MeV, $N_f = 3$, for with λ_q= 0.02 and $\lambda_g = 0.08$

Table 3: Result of photonic rate $E_\gamma \frac{dR_\gamma}{d^3q}$ in $u\bar{d} \rightarrow \gamma g$ atT_C=195MeV with λ_q=0.02, $\lambda_g = 0.08$

E_γGeV	$E_\gamma \frac{dR_\gamma}{d^3q}(GeV^2fm^4)^{-1}$				
	T=175 MeV	T=200 MeV	T=225MeV	T=250 MeV	T=275MeV
	α^{Str}=0.0354	α^{Str}=0.3316	α^{Str}=0.3141	α^{Str}=0.2998	α^{Str}=0.2881
0.75	2.4182E-13	1.8127E-12	3.1382E-12	4.9209E-12	7.1689E-12
1.5	3.9526E-15	6.4923E-14	1.7343E-13	3.8613E-13	7.5190E-13
2.25	5.9428E-17	1.8335E-15	7.4699E-15	2.3335E-14	6.0001E-14
3	8.6703E-19	4.8237E-17	2.9895E-16	1.3070E-15	4.4264E-15
3.75	1.2458E-20	1.2278E-18	1.1563E-17	7.0678E-17	3.1496E-16
4.5	1.7736E-22	3.0668E-20	4.3870E-19	3.7470E-18	2.1960E-17
5.25	2.5097E-24	7.5691E-22	1.6440E-20	1.9615E-19	1.5114E-18

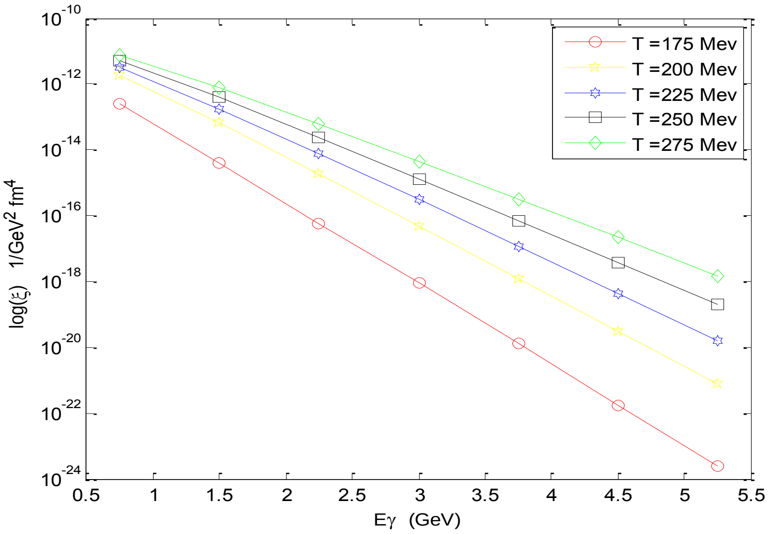

Figure 2. Photon flow rate due to Eγ for $u\bar{d} \rightarrow \gamma g$ system T_c= 195 MeV, $N_f = 3$, for with λ_q= 0.02 and $\lambda_g = 0.08$

Table 4. Result of photonic rate $E_\gamma \frac{dR_\gamma}{d^3q}$ in $u\bar{s} \rightarrow \gamma g$ at T_C=155 MeV with λ_q=0.02, $\lambda_g = 0.08$

E_γ **Gev**	$E_\gamma \frac{dR_\gamma}{d^3q}(\boldsymbol{GeV^2 fm^4})^{-1}$				
	T=175 MeV	T=200 MeV	T=225MeV	T=250 MeV	T=275MeV
	α^{Str}=0.3425	α^{Str}=0.3229	α^{Str}=0.3074	α^{Str}=0.2948	α^{Str}=0.2842
0.75	9.0299E-13	1.8006E-12	3.1239E-12	4.9062E-12	7.1559E-12
1.5	1.8467E-14	6.4053E-14	1.7162E-13	3.8301E-13	7.4724E-13
2.25	3.0278E-16	1.8050E-15	7.3782E-15	2.3110E-14	5.9550E-14
3	4.6422E-18	4.7433E-17	2.9500E-16	1.2933E-15	4.3901E-15
3.75	6.8962E-20	1.2064E-18	1.1403E-17	6.9902E-17	3.1225E-16
4.5	1.0062E-21	3.0119E-20	4.3244E-19	3.7045E-18	2.1764E-17
5.25	1.4512E-23	7.4306E-22	1.6200E-20	1.9387E-19	1.4976E-18

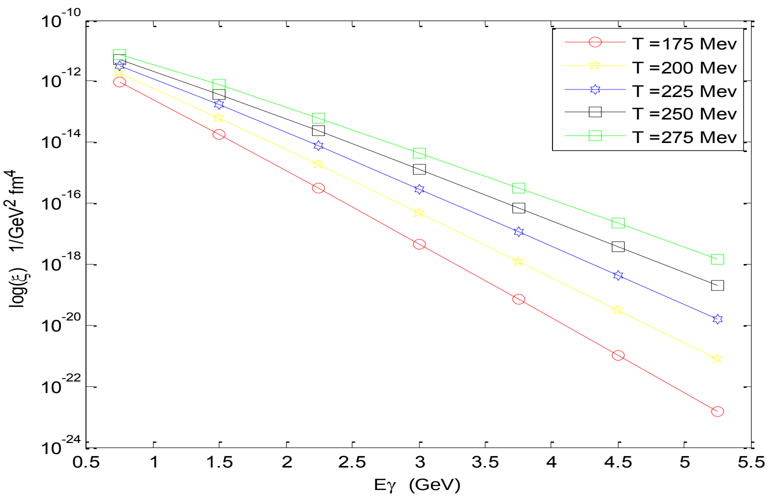

Figure 3. Photon flow rate due to Eγ for $u\bar{s} \rightarrow \gamma g$ system T_c= 155 MeV, $N_f = 4$, for with λ_q= 0.02 and $\lambda_g = 0.08$

Table 5. Result of photonic rate $E_\gamma \frac{dR_\gamma}{d^3q}$ in $u\bar{s} \rightarrow \gamma g$ at T_C=195 MeV with λ_q=0.02, $\lambda_g = 0.08$

E_γGev	$E_\gamma \frac{dR_\gamma}{d^3q}(GeV^2 fm^4)^{-1}$				
	T=175 MeV	T=200 MeV	T=225MeV	T=250 MeV	T=275MeV
	α^{Str}=0.3824	α^{Str}=0.35822	α^{Str}=0.3392	α^{Str}=0.3238	α^{Str}=0.3111
0.75	9.3031E-13	1.8441E-12	3.1826E-12	4.9746E-12	7.2234E-12
1.5	1.9546E-14	6.7444E-14	1.7993E-13	4.0010E-13	7.7811E-13
2.25	3.2330E-16	1.9173E-15	7.8045E-15	2.4359E-14	6.2581E-14
3	4.9799E-18	5.0618E-17	3.1349E-16	1.3696E-15	4.6353E-15
3.75	7.4200E-20	1.2912E-18	1.2154E-17	7.4244E-17	3.3066E-16
4.5	1.0849E-21	3.2304E-20	4.6186E-19	3.9427E-18	2.3095E-17
5.25	1.5673E-23	7.9824E-22	1.7329E-20	2.0667E-19	1.5917E-18

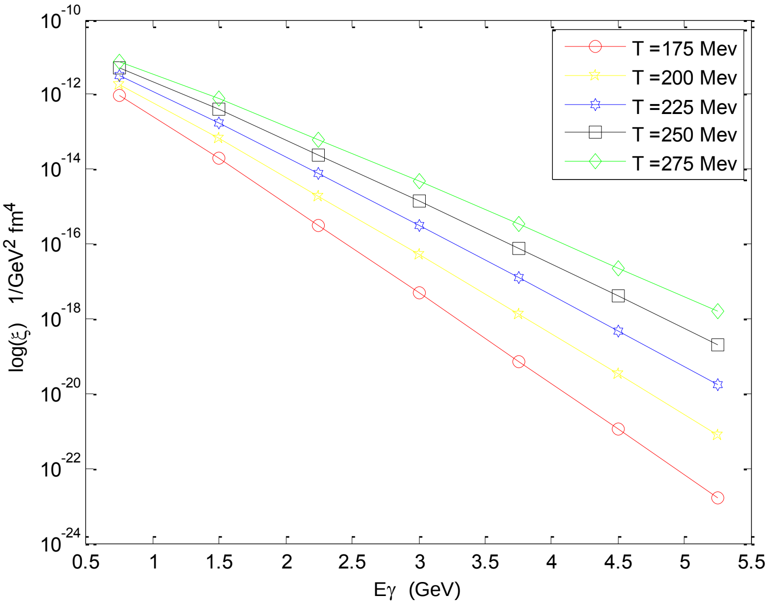

Figure 4. Photon flow rate due to Eγ for $u\bar{s} \rightarrow \gamma g$ system T_c= 195 MeV, $N_f = 4$, for with λ_q= 0.02 and $\lambda_g = 0.08$

4. Discussion

The flow photons radiation rate from annihilation an equilibrated quark-anti quark processes in plasma phase suffering hard interaction due temperature T. It fully includes the interferences of flow photons has motivated by looking at cuts of the retarded photon self-energy Im $\prod_{ret}^{\mu-\vartheta}(E_\gamma, T)$.In nearly the emission flow photons rate o from an equilibrated quark-anti quark annihilation processes at plasma phase at leading-order strength coupling has determined due quantum chromodynamic theory and concerning in relativistic heavy-ion collisions. These flow rates will contains quark antiquark annihilation and hard processes of pair including coherence effects, however, in this paper, we use the fugacity of quark and gluon to show the validity of the flow photon production rates. Here, the flow photons rate emission from quark –antiquark interaction in higher energy species, for up, anti-down and up anti strange quarks system have studied under the quantum chromodynamic theory. The flow of photons rate for two system have been useful tool to promising probing to investigate the colour chromodynamic theory. However, the photons rate will be supplied a good knowledge about the structure of nucleons and nuclei especially about the structure of neutrons and protons and understanding the building of neutrons and protons by quarks and gluon. However, the plasma phases of higher energy photons emission in range $0.75 \leq E_{\gamma} \leq 5.25$GeV have much more frequently produced in quark anti quark processes, it has predicted in the critical temperature $155 \leq T_c \leq 195$MeV from spectrum energy in hadronic phase. Furthermore, the quark anti quark s in higher energies plasma media interaction with each other at hadronic phase with Fermi and Boson distribution under space-time fugacity factors. At one loop, the quarks interaction will be losing some more energy to emission photons gamma in hot plasma medium.

Juttner distribution for quark anti quark and gluon have been used to describe the fugacity in quantum space and used to calculate the flow photonic rate over momentum space. At sufficiently, the strength coupling of quantum chromodynamic in table (1) are increased with decreasing the momentum of system, it show that strength coupling proportional inversely with momentum of system with any critical temperature.

As recall that to tables (2), (3), (4) and (5) and figures from (1) to (4), it was shown that the flow photons rate increases with increases the temperature of plasma system (from 175 to 275), it indicate the photons rate proportional with square of plasma media temperature. On the other hand the flow photons rate decreasing with increasing the photons energy because enhancement the flow photons rate proportional exponentially with photons energy $e^{-\frac{E_{\gamma}}{T}}$. This indicate that's photons rate at critical temperature spectrum (155 to 195 MeV) increases with decreases photons energy E_{γ} and increases the hot plasma region. Due to strong interaction at high energy the quarks interaction by exchange a particle called gluons, it's explained the feature of strong interaction. Since the fugacity consideration indicate the devation effect on flow photons rate at quark gluon systems at hadronic phases according to Bose and Fermi distribution to employ the analytical calculation. Furthermore, the flow photons rate in tables (2 to 5) and figures (1 to 4) are increasing with decreases the strength coupling colour quantum and the quarks system emission more photons for small strength coupling, its show that similar behavior for two system with same critical temperature T_c = 155 and 195MeV,

5. Conclusion

The photons would actually be emission from quark anti quark interaction processes until required the processes allow hadronic phase to be fully formed.

Naturally, the flow photon rate has depended on the quark and anti-quark content medium temperature. The authors conclude that the strength coupling quantum colour sensitivity effect to the emission photons spectra rate is large, due to the flavour number, critical temperature and temperature of plasma media.

Although, the photons emissions at different momentum especially between 1.4 to 2.2 Ge and the photons rate spectrum was harder. For the quark anti quark processes study at high energies, however, the propagation of gluons effect on photons rate was negligible.

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