QUANTIFYING THE ENVIRONMENTAL IMPACTS OF TRAFFIC SIGNALS

by

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In everlasting and loving memory to my father,

Javaid Naiz Khan

ABSTRACT

Increasingly there is the recognition that motor vehicles are a significant source of pollutants that are responsible for degrading air quality. Concern over the negative impact that automobiles have on air quality has prompted renewed interests in methods for quantifying vehicle tailpipe emissions. Three emissions in particular, namely carbon monoxide, hydrocarbons and nitrogen oxides, are of interest, as they are key components of ground level ozone and smog. The increasing importance that the public places on air quality is demonstrated by the passage of specific air quality legislation in many parts of the United States, and more recently by implementation of a mandatory vehicle emissions testing program in Ontario.

It is generally recognized that not only must efforts focus on the vehicle emissions controls and the formulation of the fuel, but efforts must also be made to implement traffic control and management strategies that provide environmental benefits as well as other benefits such as travel times savings. The difficulty that has faced many traffic engineers is the lack of suitable evaluation tools capable of quantifying fuel consumption and emissions impacts. Traditional traffic signal-timing design techniques have been developed with the sole objective of minimizing average vehicle delay. However, increasingly, it is desired that the environmental impact of design decisions also be considered.

In this research, non-linear-regression models are presented that can be used to estimate the additional mass of carbon monoxide, hydrocarbons, and nitrogen oxides that would be expected to be produced by vehicles traversing a roadway if a traffic signal with known signal timing characteristics was installed. The proposed models use traffic demands, roadway characteristics, and traffic signal timing parameters as explanatory variables. Data for calibrating these models are obtained from the application of INTEGRATION, a microscopic traffic simulation model, to 8100 individual traffic and signal control scenarios. The validity of using INTEGRATION as a source for emission data is examined using field data. The proposed emission models have adjusted R^2 values ranging from 0.76 to 0.95.

A comparison of the proposed models to similar models contained within the Canadian Capacity Guide (CCG) indicate marked differences in the relative and absolute impact that traffic signals have on the quantity of pollutants produced. In general the proposed models are much less sensitive to the degree of saturation than are the CCG models, resulting in much lower estimates of CO, HC, and NO_x under congested traffic conditions.

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Chapter 1

Introduction

Increasingly there is the recognition that emissions from motor vehicles significantly contribute to the degradation of air quality. Concern over the negative impact that automobiles have on air quality has prompted renewed interests in methods for quantifying vehicle tailpipe emissions. The increasing importance that the public places on air quality is demonstrated by the passage of specific air quality legislation in many parts of the United States, and more recently by the implementation of a mandatory vehicle emissions testing program in Ontario (MTO, Ontario). Since the passage of the Clean Air Act Amendments (CAAA) of 1990 and the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, the relationship between air quality problems and transportation networks has become one of the most important and urgent concerns that need to be addressed by transportation professionals at all levels (Yu, 1997).

While cars are becoming lighter, more fuel-efficient and less polluting, the ever-increasing number of vehicles on the roads reduces the benefits of improved technologies. In Canada, the transportation sector accounts for 75 percent of carbon monoxide (CO), 67 percent of nitrogen oxides (NO_x), and 49 percent of hydrocarbons (HC) (Anderson, et al., 1996). On average, in Canada, each car emits over five tonnes of air pollutants annually. In Ontario automobiles have accounted for approximately 33 percent of the volatile organic compounds VOCs and 20 percent of the nitrogen oxides (NO_x), the precursors of ground-level ozone (Helali and Hutchinson, 1994). Vehicle emissions at or near intersections are usually higher than on the street segments between intersections because vehicles are often required to decelerate, idle, and then accelerate in response to traffic controls (i.e. traffic signal, stop or yield signs).

1.1 Sources of Vehicle Emissions

The sources of automobile emissions can be divide into three main categories, namely Exhaust, Evaporative and Refueling.

1.1.1 Exhaust Emissions

Automobile exhaust emissions result from the combustion of automotive fuels. Under ideal burning conditions, the products of combustion are carbon dioxide, water and nitrogen. The products of incomplete combustion are hydrocarbons, nitrogen oxides, carbon monoxide, carbon dioxide and water. Although carbon dioxide is a naturally occurring gas, elevated levels due to human activity contribute to climate change. Nitrogen oxide, carbon monoxide and hydrocarbons contribute to the formation of ground-level ozone (smog) and acid rain. The main focus of this research is on these tailpipe emissions.

1.1.2 Evaporative Emissions

Hydrocarbon pollutants also escape into the air through fuel evaporation. The net air quality impact of evaporative emissions is generally compounded by the fact that evaporative emissions are highest during hot weather when atmospheric conditions are also conducive to the formation of ground level ozone. Evaporative emissions occur in several ways:

DIURINAL: Gasoline evaporation increases as the temperature rises during the day, heating the fuel tank and venting gasoline vapours.

RUNNING LOSSES: The hot engine and exhaust system can vaporize gasoline when the car is running.

HOT SOAK: The engine remains hot for a period of time after the car is turned off, and gasoline evaporation continues when the car is parked.

1.1.3 Refueling Losses

Evaporative emissions also occur during the vehicle refueling process. These emissions occur primarily in one of two ways. First, when the tank is filled with liquid fuel gasoline vapours (hydrocarbons), which are always present in the fuel tank, are displaced and forced into the atmosphere. Second, if liquid fuel is spilled during the refueling process, the volatile nature of the fuel causes it to quickly evaporate.

1.2 Objective of Research

In this research, our goal is to develop analytical models that can be used to estimate the additional mass of carbon monoxide, hydrocarbons, and nitrogen oxides that would be expected to be emitted from the tailpipe of vehicles as a direct consequence of the traffic signals. Our objective is to develop models that use traffic demands, roadway characteristics, and traffic signal timing parameters as explanatory variables. Such models provide a direct relationship between traffic control strategies (i.e. signal timing plans) and tailpipe emissions, and thereby permit traffic engineers to explicitly assess the environmental impacts of various signal control strategies. Furthermore, these expressions can be used in practice to supplement existing techniques for comparing candidate traffic control strategies on the basis of delay by permitting a comparison to also be made on the basis of vehicle tailpipe emissions. Thus, these models enable traffic engineers to explicitly quantify the emissions and delay trade-off associated with different signal timing strategies. The models proposed in this thesis are compared to the models contained in the Canadian Capacity Guide.

The production of vehicle tailpipe emissions is a complex process that is dependent on many factors including engine size and type, load on the engine, engine speed, fuel to air ratio during combustion, ambient air temperature, type and condition of air pollution control devices (e.g. catalytic converters), type of fuel, and condition of engine. Engine load is dependent on vehicle speed and acceleration, horizontal and verticle curvature of the road, mass of the vehicle, transmission type, and the use of vehicle air conditioning.

The degree to which an emission estimation method should explicitly model each of these factors depends on the purpose for which the emission estimate is being made and on the influence that the factor has on emissions. The analytical models proposed in this thesis are developed by calibrating regression models on the basis of simulated traffic and emission data. Simulated traffic data were used because field data were not available and are nearly impossible to collect. Recognising that the validity of the resulting emission models is largely dependent on the validity of the traffic and emission data, significant efforts were made to validate the simulated data.

1.3 Thesis Organization

The second chapter provides a background review of the literature on different relevant simulation and analytical emission estimations techniques. This review reveals the current lack of analytical models suitable for estimating the impact of traffic signals on vehicle tailpipe emissions. The review in this thesis attempts to address this need. Consequently Chapter 2 also discusses the approach adopted in this research.

The third chapter describes an evaluation of the accuracy of the traffic and emission data produced by the microscopic simulation model INTEGRATION. Three key components of the simulation model are validated. First, the microscopic vehicle behaviour, in terms of speed and acceleration, is compared to field data and to another simulation model. Second, the simulation model predictions of average vehicle delay are compared to analytical estimates of delay for a range of traffic and signal timing conditions. Third, the emission submodels utilised within INTEGRATION to estimate tailpipe emissions are validated.

The fourth chapter describes the development of the proposed analytical emission models. The generation of the simulated data is described. The emission models obtained from regression analysis are discussed, and a general relationship between signal control parameters and emission rate is established. Furthermore a comparison of the proposed emission models to existing techniques is also made.

The fifth chapter investigates implications that the proposed models have for signal design For example, we examine the question of whether or not the cycle length providing the minimum average vehicle delay also provides the minimum total quantity of tailpipe emissions?.Description of various scenarios and applications of equations are also provided.

In the last chapter, conclusions regarding the validity of the proposed models and recommendations for their use are made.

Chapter 2
BACKGROUND

The aim of this research is to derive analytical expressions for estimating vehicle tailpipe emissions and fuel consumption as a function of traffic and signal timing parameters. These expressions could be used in practice to supplement existing techniques for comparing candidate traffic control strategies on the basis of delay by permitting a comparison to also be made on the basis of vehicle emissions.

2.1 Emission Modeling

It is generally well recognized that vehicle emissions are a function of many factors, including engine type and condition, driving characteristics (i.e. acceleration rate, speed, etc.), air temperature, type of pollution controls, etc. There currently exist four broad categories of methods for estimating vehicle tailpipe emissions.

2.1.1 Macroscopic Models

The first category, macroscopic emission models, is based on an aggregate representation of on-road vehicle activities and a number of assumptions regarding average driver behaviour. In this model specific vehicle driving cycles are defined, and analytical expressions are developed on the basis of emission measurements made on vehicles emulating that specific driving cycle on a vehicle dynamometer. The US Environmental Protection agency (EPA) model MOBILE5 is based on this approach. The model was first developed as MOBILE1 in the late 1970s, and has been periodically updated to reflect the collection and analysis of additional emission factor testing results over the years, as well as changes in vehicle, engine, and emission control system technologies, changes in applicable regulations and emission standards and test procedures, and improved understanding of in-use emission levels and the factors that influence them (USEPA, 1999).

The current methods used for determining emission factors are based on laboratory-established emission profiles for a wide range of vehicles with different types of emission control technologies. The emission factors are produced based on average driving characteristics embodied in a predetermined driving cycle as part of the Federal Test Procedure (FTP). This test cycle was originally developed in 1972 as a certification test and has a specified driving trace of speed versus time, which is intended to reflect actual driving conditions both on arterial roads and highways. Emissions of CO, NO_x, and HC are integrated and collected for three sections of the cycle (called bags) and are used as base emission rates (Barth et al, 1999). Adjustments are then made to the base emission rate through a set of correction factors. There are correction factors for each bag, which are used to adjust the basic emission rates to reflect the observed differences between different modes of operation. There are also temperature correction factors and speed correction factors used to adjust the emission rates for non-FTP speeds. These speed correction factors currently are derived from limited off-cycle testing (speeds greater than 57 mph, accelerations greater than 3.3 mph/s) performed on laboratory dynamometers. The drawback to this approach is that the FTP does not accurately characterize today’s actual driving behaviour. An additional problem is that the speed correction cycles used to update the current models do not properly represent either facility-specific or area-wide travel in urban areas. These speed correction cycles were not developed from data representative of vehicle operations in urban areas. (Ross et al, 1996).

EPA is now in the process of revising the MOBILE model. MOBILE6, currently scheduled for release in 2000, will differ significantly in both structure and data requirements for current versions of the model (MOBILE5a and 5b). MOBILE6 will incorporate updated basic emission rates, off-cycle (“real world”) driving patterns and emissions, separation of start and running emissions, improved correction factors, and updated fleet information. “Running” emission factors will be represented in terms of gram/mile emission rates, and will be based only on hot stabilised engine operation. “START” emissions will be presented in terms of emission increments; that is, the added emissions resulting from vehicle start-ups. However the accuracy of the emission estimate still remains a function of similarity between a selected driving cycle and the conditions being examined. There is still much work to be done in most areas of the model; thus, it is not possible at this time to provide "bottom line" answers as to exactly what impact these changes will have on vehicle emission factor estimates and emission inventories developed from those factors (Brzezinski and Newell, 1998).

2.1.2 Microscopic Models

A second category is microscopic models. Recent research has shown that certainly average speed, and perhaps even simple estimates of the amount of delay and the number of stops on a link, are insufficient measures to fully capture the impact of ITS strategies such as traffic signal co-ordination. Specifically it has been shown that for the same average speed, one can observe widely different instantaneous speed and acceleration profiles each resulting in different levels of emissions (Rakha et al, 1999). In an attempt to address this, microscopic emission models are coupled with microscopic traffic simulation models in which individual vehicle behaviour (speed and acceleration) is represented and emissions are estimated each time step (typically on the order of 1 second).

These models have the benefit of being able to estimate emissions for any traffic scenario, rather than a limited set of pre-defined scenarios. Furthermore, these estimates are automatically sensitive to all factors that influence vehicle speed and/or accelerations. Many traffic simulation and optimising models such as EMFAC (California EPA, 1995), INTEGRATION (Van Aerde, 1999), NETSIM (Rathi and Santiago, 1989), and MEASURE (Washington & Guenslar, 1998), have incorporated their own emission estimation models to predict emissions. Unfortunately, in many applications, the additional effort required to code the network, calibrate the model, and execute the model for each alternative traffic control strategy, is not justified. The application of microscopic tools to the estimation of fuel consumption and vehicle emissions may be too costly and time consuming for many practical applications. In addition, such tools may require more data than can be collected, or a level of accuracy that cannot be achieved with existing data (Rakha et al, 2000).

2.1.3 Modal Emission Models

The third category in emission modeling techniques is known as modal emission models. In this approach emissions are estimated based on a narrow range of vehicle operating modes, such as idle, different levels of acceleration/deceleration, and steady-state cruise. Emissions are estimated fairly accurately if detailed vehicle dynamics are known, such as second-by-second vehicle trajectories. Further, a modal emission model can be used to derive better statistical emission estimates for different roadway facility type or specific transportation scenarios. However, to determine an emission inventory for a large regional traffic network using a modal emissions model requires extensive microscopic traffic data. These data are difficult to measure or simulate and are burdensome to handle (Johnston et al., 1996).

2.1.4 Analytical Models

The fourth category of estimation techniques is aggregate analytical models, in which estimates of emissions are made as a function of average vehicle travel characteristics, such as speed, delay, and/or number of stops. The emission model provided in the Canadian Capacity Guide (CCG) is of this type. It can be used to estimate emissions in the vicinity of a signalised intersection. The influence of the intersection is presumed to occur over a distance of 100 m upstream and downstream of the intersection. The unit values of pollutant emissions were determined using a vehicle simulation model applied to expected Canadian fleet compositions in the years 1995 and 2000. The fleet composition and overall emission levels are based on the average Ontario fleet age distribution and its age-related performance deterioration (Teply, 1995).

Table 2.1 – Passenger car unit fuel consumption and emissions from the CCG emission model (Teply, 1995)

Year 1995 Composite Fleet							
Type	U_{idle} (g/s)	U_{stop} or e_{stop} (additional g/stop for v = km/h)			U_{cruise} or e_{cruise} (g/100 m at v = km/h)		
		40	50	60	40	50	60
Fuel	.312	4.55	6.10	7.75	3.20	4.85	7.15
CO	.0888	1.070	1.440	1.790	.580	.868	1.246
HC	.0205	.066	.089	.112	.062	.076	.092
NOx	.0015	.142	.217	.303	.026	.047	.080
Year 2000 Composite Fleet							
Type	U_{idle} (g/s)	U_{stop} or e_{stop} (additional g/stop for v = km/h)			U_{cruise} or e_{cruise} (g/100 m at v = km/h)		
		40	50	60	40	50	60
Fuel	.267	3.89	5.21	6.63	2.74	4.15	6.12
CO	.0837	1.01	1.35	1.69	.546	.817	1.174
HC	.0175	.056	.076	.095	.053	.065	.078
NOx	.0012	.120	.182	.0254	.022	.040	.067

Average fuel consumption and emission values provided in the CCG are shown in Table 2.1.

The equation for calculating total emission from all vehicles passing through the intersection zone of influence during one hour of signal operation is given in Equation 2.1.

$$E = [\sum_j \sum_i (N_{sij} * e_{stopv}) + \sum_j \sum_i (d_{sij} * q_{ij} * e_{idle}) + \sum_j \sum_i (q_{ij} * e_{cruise})]/1000 \qquad (2.1)$$

where:

E = estimate of emission in the zone of influence of the signalised intersection (kg)

N_{sij} = number of stops in lane *i* during phase *j*

e_{stopv} = additional unit of passenger car emission caused by stopping and resuming a given cruise speed *v* (g/stop) from Table 2.1

q_{ij} = arrival flow in lane *i* during phase *j* (pcu/h)

$d_{s_{ij}}$ = average stopped delay in lane *i* during phase *j* (s/pcu).

e_{idle} = unit of passenger car emissions per second of idling (g/s) from Table 2.1

e_{cruise} = passenger car emissions over a distance of 100 m at a given cruise speed on level ground (g/100m) from Table 2.1

If only comparative values of emissions related to signal operation are required, the last term of Equation 2.1 may be omitted. Fuel consumption is determined in a similar manner through the use of Equation 2.2.

$$E \; ? \; [?_{j} \; ?_{i}(N_{sij} * u_{stopv}) \; ? \; ?_{j} \; ?_{i} \; (d_{sij} * q_{ij} * u_{idle}) \; ? \; ?_{j} \; ?_{i} \; (q_{ij} * u_{cruise})]/1000 \qquad (2.2)$$

where:

E = estimate of fuel consumption in the zone of influence of the signalised intersection (kg)

N_{sij} = number of stops in lane *i* during phase *j*

u_{stopv} = additional unit of passenger car fuel consumption caused by stopping and resuming a given cruise speed *v* (g/stop*)* from Table 2.1

q_{ij} = arrival flow in lane *i* during phase *j* (pcu/h)

$d_{s_{ij}}$ = average stopped delay in lane *i* during phase *j* (s/pcu).

u_{idle} = unit of passenger car fuel consumption per second of idling (g/s) from Table 2.1

u_{cruise} = passenger car fuel consumption over a distance of 100 m at a given cruise speed on level ground (g/100m) from Table 2.1

The advantage of these models is that they can be applied with relatively little effort and can be incorporated within the existing signal timing design process.

2.2 Research Approach

The approach taken in this research is to make use of INTEGRATION, a microscopic simulation model, to generate emission data over a wide range of traffic, roadway, and signal conditions. These data are then used to calibration non-linear regression models. It is recognised that the validity of the proposed regression models is largely a function of the characteristics of the microscopic simulation model that was used to generate the emission data. Therefore, an examination of the validity of INTERGRATION is made in three key areas. The first is to examine the degree to which the model is able to realistically model the microscopic behaviour of vehicles in terms of speeds and accelerations, in the vicinity of traffic signals. The second is to compare the aggregate vehicle behaviour in terms of average delay. The third examination is made to estimate vehicle tailpipe emissions every second. These sub-models have been verified by other researchers and reported in the literature. In this research only a brief assessment of the validity and credibility of these emission sub-models is provided. The proposed regression models are compared to the models presented in the Canadian Capacity Guide (CCG) and conclusions regarding differences between these models are made.

Chapter 3
EVALUATION OF SIMULATION MODEL

In this chapter an evaluation of the microscopic vehicle behaviour was conducted by comparing the vehicle speed and acceleration values predicted by the INTEGRATION model to field observations. The accuracy of the INTEGRATION model prediction is also compared to similar predictions from the NETSIM simulation model. The observed data and the NETSIM results were determined by Hallmark and Guenslar (1999a, 1999b). The main objective of their research was to explore whether simulation models can be used to output realistic estimates of individual-vehicle activity and to identify drawbacks in their use. It is important to note that both of these publications describe the same research. The first paper (Hallmark and Guenslar, 1999a) was presented at the 1999 annual meeting of the Transportation Research Board. The second paper (Hallmark and Guenslar, 1999b) is the same paper (albeit with minor revisions) published in the Transportation Research Record. Significant differences between the NETSIM results are observed, though the results are reported to be from the same test scenario.

3.1 Microscopic Vehicle Behaviour

The INTEGRATION model was developed with the intent to provide a single model that could represent many isolated traffic functions (freeway sections, arterial sections, signalized intersections, etc.) in an integrated and continuous fashion. Added to this, the model incorporates dynamic traffic assignment, thereby allowing drivers to respond to delay by altering their routes while traveling.

To achieve these attributes effectively, INTEGRATION models traffic flow microscopically as a series of individual vehicles and tracks each vehicle’s progress at a resolution of one deci-second. This permits considerable flexibility in representing spatial variations in traffic conditions over time and allows for the analysis of such traffic phenomena as shockwaves, gap acceptance, and weaving.

While modeling each vehicle as a single entity, INTEGRATION also uses user-specified macroscopic traffic flow relationships (speed-flow, speed-density, etc.) to determine such microscopic characteristics as vehicle speed and headway. In this sense, INTEGRATION is not an entirely microscopic model, but allows traffic professionals to validate the model against familiar relationships.

Vehicles may be modeled as one of up to five vehicle types, which permits the user to implement link and lane restrictions based on vehicle type. For example, a separate vehicle type may be used for high-occupancy vehicles, which may be allowed to use an extra lane on a facility while other vehicle types are restricted. Also available is the ability to specify varying acceleration profiles and vehicle occupancies based on the size or type of vehicle (e.g., truck or bus). Routing characteristics may also be varied by vehicle type.

Another of INTEGRATION's modeling capabilities is lane changing. In general, as drivers traverse a link, they will choose the lane that permits them to travel at the highest possible speed, provided that they are not restricted to a certain lane to make an upcoming turning movement or are not restricted to that lane due to their vehicle type.

Besides INTEGRATION's extensive ability to model integrated traffic networks, the output provided by the model is also extensive. For example, statistics may be gathered on a link-by-link basis once for the entire simulation period or as a time series at a user-specified frequency. Similarly, each vehicle may be tracked through the network by producing statistics for each vehicle at the downstream node of every link. The user may also place loop detectors anywhere in the network, which then produce output for each vehicle that passes over them. The model produces such measures of effectiveness (MOEs) as person-kilometers traveled, travel time in person-seconds, travel time in vehicle-seconds, and number of stops experienced. Besides these data, an extensive set of environmental MOEs, including vehicle fuel consumption and emissions (HC, CO, NO_x), may be produced for every link, for each vehicle, and/or for the entire simulation period.

3.1.1 Field Data

The field data used in the Hallmark and Guenslar (1999a, 1999b) research was collected with hand- held laser range-finder (LRF) devices at the signalized intersections that were studied. The sampling procedure was done randomly by capturing the next available vehicle in each lane studied. Data were collected at 30 different intersections operating at LOS C. To adequately represent the range of activity along signalized roadways, sampling was conducted at the stop line, behind the stop line and at midblock. Individual vehicle traces were reported in 1-sec intervals for the length of time that the vehicle was tracked. Using this information, acceleration and corresponding speed were identified for each second of activity. For the purpose of comparison to simulation results a typical four-leg intersection was defined with specific traffic demands and signal timings. Composite field data were constructed by aggregating a subset of the field data obtained at the 30 locations. The specific criteria used to define the subset and the method of aggregation are not known as they have not been described in the literature.

3.1.2 Test Intersection

On the basis of the description provided in the two papers by Hallmark and Guenslar (1999a and 1999b), a single 4-leg signalized intersection was modeled with INTEGRATION as illustrated in Figure 3.1.

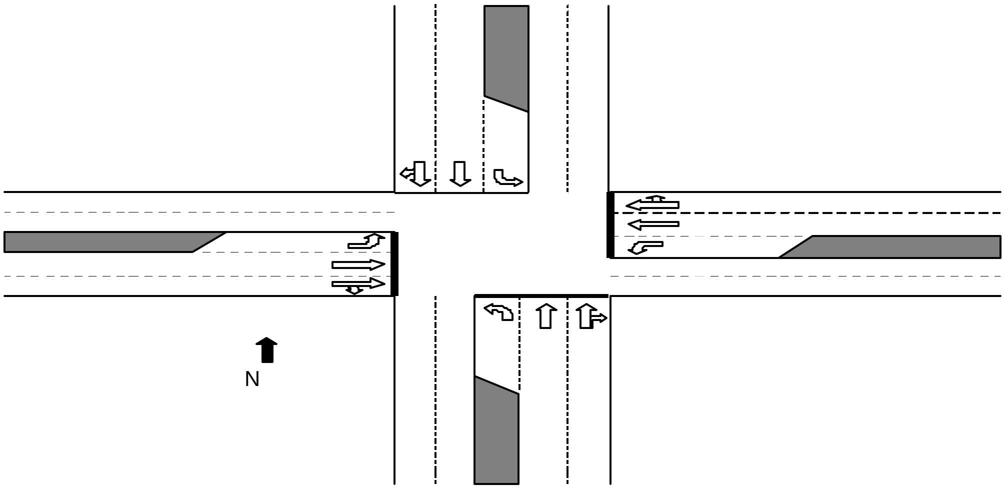


Figure 3.1 - Test intersection for model evaluation

All approaches consisted of an exclusive left-turn lane, an exclusive through lane, and shared through and right-turn lane. Both through and shared through and right lanes were 0.5 km in length. The left turn lane was 0.0762 km long. An unadjusted saturation flow rate of 1800 vph was selected for all lanes.

The papers by Hallmark and Guenslar specify total approach demands, but do not specify the individual turning movement volumes. Therefore, typical turning movement proportions were initially chosen for each turning movements (5% for left turns and 10% for right turns). These proportions were adjusted such that the over-all intersection level of service was compatible with LOS C as specified by Hallmark and Guenslar. The traffic demands applied to the intersection are provided in Table 3.1.

Table 3.1 - Traffic demand on signalised intersection

Intersection Approach	Demand (vph)			
	Left-Turn	Through	Right-Turn	Total
Eastbound	66	1119	132	1317
Westbound	90	765	45	900
Northbound	70	1200	141	1411
Southbound	10	1150	129	1289

All vehicle demands enter the approach links with exponentially distributed time headways. The intersection is modeled with a 2-phase fixed time signal having a cycle length of 100 seconds, and a loss time of 4 seconds per phase. Green time was equally (46 seconds per phase) split between the East-West and North-South approaches.

3.1.3 Simulation Data

The network description provided by Hallmark and Guenslar does not specify link free speed (S_f), speed at capacity (S_c) and speed dispersion factor (SDF), all key traffic parameters required for simulation within INTEGRATION. Therefore the network was simulated for a number of combinations of parameter values, as defined in Table 3.2. In all cases a jam density of 100 veh/km was used.

Table 3.2 - Parameter value combinations

S_f (km/hr)	S_c (km/hr)	SDF
60	50	0.0,0.3,0.5
60	55	0.0,0.3
65	50	0.0,0.3
65	55	0.0
65	60	0.0
70	60	0.0

The intersection was modeled for 1 hour using the INTEGRATION simulation model. Simulation output describing position, speed, and acceleration was obtained for each vehicle each second. These data were then processed to obtain the proportion of time spent by vehicles in each speed and acceleration range. To be consistent with the results provided by Hallmark and Guenslar, data were only obtained for vehicles within 76m (250 ft) of the stopline on the approach link and 76m (250 ft) after the intersection stop line on the outbound link. Also, when estimating the percent of vehicle activity by bin, stop delay was minimized to 1 second per vehicle so that high delay values (i.e. speed = 0) did not overwhelm all other vehicle activity fractions.

The method adopted for deleting high delay values (i.e. speed = 0) from the simulation output is best explained by an example. Consider the example time series of vehicle speed as a function of time as plotted in Figure 3.2

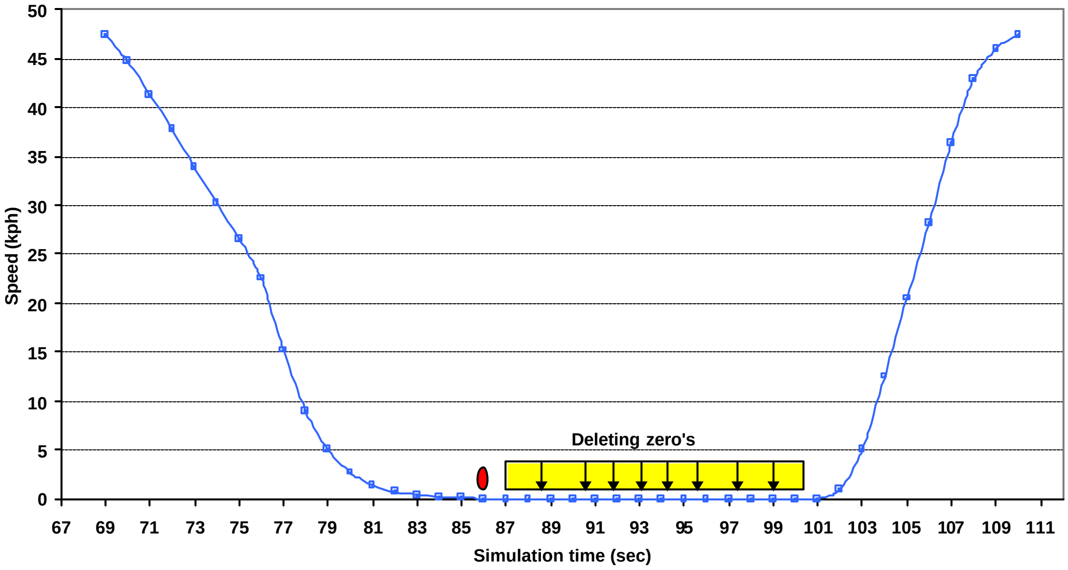


Figure 3.2 - Single vehicle velocity as a function of time

The vehicle decelerates from a speed of 48 km/h to a stop in response to a red interval at the traffic signal. The vehicle remains idle for 16 seconds (time 86 to 101 seconds). To minimize the high delay value, all the zero speed observations are deleted with the exception of the first one shown as an oval in Figure 3.2. The purpose of deleting the stopped delay data can be illustrated by examining the frequency distribution plots for the single vehicle activity (speed) at the study intersection before and after the deletion of observations of speed = 0. Figure 3.3 illustrates the time frequency (number of seconds) that the vehicle is operating within different speed ranges. The first range (speed ? 0 km/h) shows 16 seconds, consistent with figure 3.2. Figure 3.4 shows the associated proportion of time (relative frequency) the vehicle is operating within each speed range

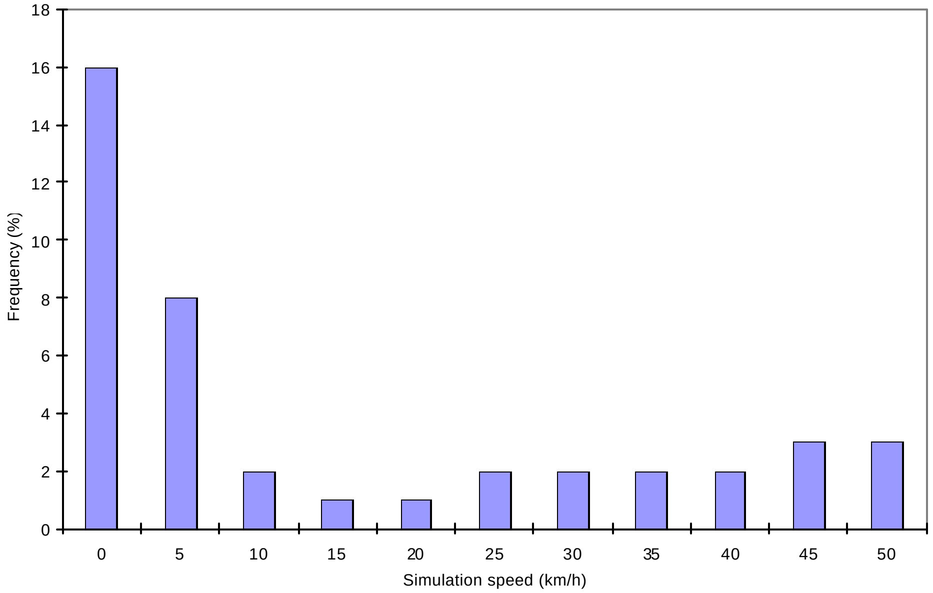


Figure 3.3 – Frequency histogram of vehicle speed

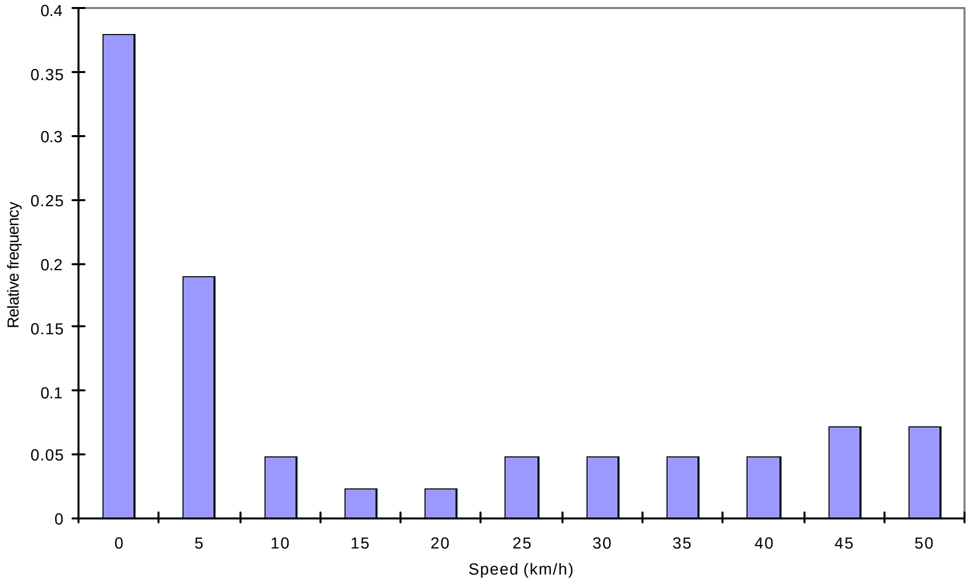


Figure 3.4 - Relative frequency histogram of vehicle speed before minimizing stop delay

It can be observed that 38% of the time this vehicle is stopped. Of course, if this same vehicle were to have arrived at the signal during a green interval, the stop delay would have been zero and all of the relative frequencies for the other speed ranges would have been much higher. Therefore, to normalize for stop delay impact, and to be consistent with the approach adopted by Hallmark and Guenslar in their paper, the stop delay is minimized to 1 second for each vehicle so that the high delay values did not overwhelm all other vehicle activity fractions.

When we reduce the 16 seconds of stop delay associated with the single vehicle in Figures 3.3 and 3.4, to just a single second, then the relative frequency of non-zero speeds (those we are interested in) become more prominent (Figure 3.5).

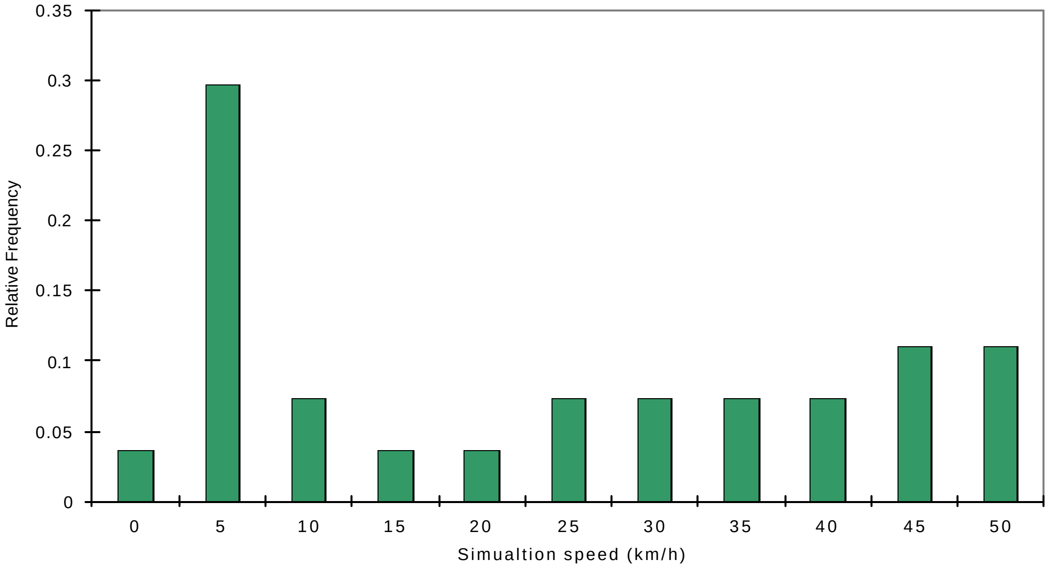


Figure 3.5 - Relative frequency histogram of vehicle speed after minimizing stop delay

3.1.4 Comparison of Vehicle Acceleration Data

Using the delay minimization approach described in the previous section, a thorough examination was conducted on the percent time spent in each acceleration range for the different combinations of free-speed, speed at capacity and speed dispersion factor. The degree to which the INTEGRATION results reflect the observed field data was quantified using Equation 3.2.

$$E = \sum_{i=1}^{n} \frac{(p_i - P_i)^2}{P_i} \qquad (3.2)$$

where:

p_i = percent time predicted by model (NETSIM or Integration) for range i

P_i = percent time from field data for range i

N = number of ranges

Using Equation 3.2, the total error associated with the proportion of vehicle time associated with each acceleration range as predicted by NETSIM (1999a), NETSIM (1999b) and INTEGRATION was calculated to be 0.19, 2.42, and 0.32 respectively, as shown in Table 3.3.

Table 3.3 – Error between predicted and observed acceleration data

			INTEGRATION					
Bin (mph/s)	NETSIM (1999a)	NETSIM (1999b)	Sf, Sc, SDF (60,50,0.0)	Sf, Sc, SDF (60,50,0.0)	Sf, Sc, SDF (60,50,0.0)	Sf, Sc, SDF (60,50,0.0)	Sf, Sc, SDF (60,50,0.0)	Sf, Sc, SDF (60,50,0.0)
-8	0.00	0.83	0.01	0.00	0.00	0.02	0.01	0.00
-7	0.00	0.61	0.01	0.00	0.00	0.01	0.00	0.00
-6	0.01	0.24	0.00	0.00	0.00	0.00	0.00	0.00
-5	0.00	0.02	0.01	0.01	0.01	0.01	0.01	0.01
-4	0.02	0.00	0.03	0.03	0.03	0.03	0.03	0.03
-3	0.00	0.01	0.04	0.04	0.04	0.03	0.03	0.03
-2	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00
-1	0.00	0.03	0.02	0.01	0.00	0.02	0.01	0.00
0	0.02	0.03	0.04	0.09	0.05	0.04	0.05	0.06
1	0.03	0.04	0.00	0.02	0.04	0.00	0.02	0.02
2	0.00	0.08	0.00	0.01	0.01	0.00	0.01	0.01
3	0.02	0.09	0.00	0.02	0.02	0.01	0.01	0.01
4	0.00	0.06	0.01	0.00	0.00	0.01	0.00	0.00
5	0.03	0.03	0.00	0.00	0.00	0.01	0.01	0.01
6	0.03	0.01	0.02	0.10	0.11	0.20	0.13	0.12
Sum	0.19	2.42	0.37	0.34	0.33	0.45	0.33	0.32
Error computed as (field-predicted)^2/field								

The two papers by Hallmark and Guenslar provide significantly different NETSIM results. The NETSIM results provided in the Transportation Research Board reference (1999a) more closely reflect the field data (E = 0.19) than do the NETSIM results (E = 2.42) provided in the Transportation Research Record reference (1999b). It is not clear why the results are different, since both papers describe the same research. On the basis of the results in Table 3.2 parameter values of S_f = 60 km/h, S_c ? 55 km/h and SDF = 0.3 for INTEGRATION provide the nearest correlation with the observed data. Figure 3.7 illustrates the percent time spent by vehicles in each acceleration range for the observed field data, predicted by NETSIM, and predicted by INTEGRATION when using these parameter values.

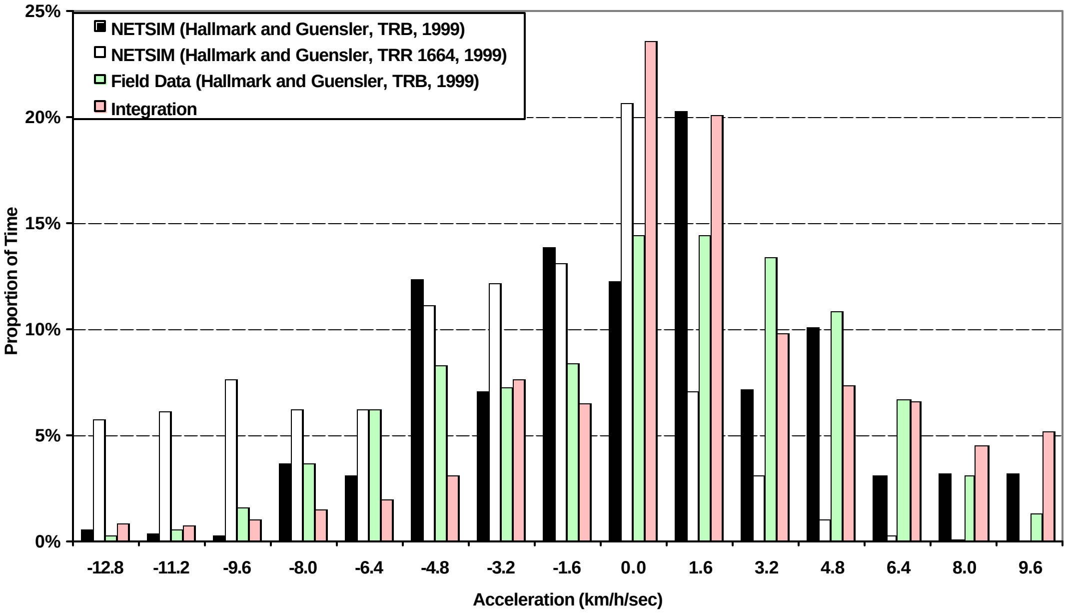


Figure 3.6 - Comparison of proportion of time spent in each acceleration range

The results depicted in Figure 3.6 suggest that INTEGRATION overestimates the proportion of time vehicles spend at very low deceleration rates (i.e. –1.6 kph/s < deceleration ? 0.0 kph/s).

3.1.5 Comparison of Vehicle Speed Data

A similar approach was adopted for examining the percent time spent in each speed range. Applying Equation 3.1, the error associated with the proportion of vehicle time associated with speed ranges as predicted by NETSIM and INTEGRATION was calculated (Table 3.4). A total error of 0.38 was computed for the NETSIM results. The total error associated with INTEGRATION depends on the parameter values selected. The minimum value of 0.32 is associated with $S_f = 65$, $S_c = 50$, SDF = 0.3. However, another combination ($S_f = 60$, $S_c = 55$, SDF = 0.3) provides a similar level of correlation with the observed data (E = 0.35) and is also the same set of parameter values selected on the basis of the examination of vehicle acceleration in the previous section. Therefore, on the basis of these results, parameter values of S_f = 60 km/h, S_c = 55 km/h, and SDF = 0.3 were selected.

Table 3.4 - Error between predicted and observed vehicle speed data

Speed Range (km/h)		Sf = 60 Sc = 50			60 55		65 50		65 55	65 60	70 60
<=	NETSIM	SDF = 0	0.3	0.5	0	0.3	0	0.3	0	0	0
0	0.00	0.05	0.06	0.06	0.05	0.06	0.05	0.06	0.05	0.06	0.05
8	0.000	0.04	0.03	0.02	0.06	0.04	0.03	0.03	0.02	0.25	0.08
16	0.010	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01
24	0.009	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.02
32	0.013	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.02
40	0.013	0.01	0.08	0.21	0.01	0.05	0.01	0.02	0.01	0.02	0.01
48	0.017	0.10	0.06	0.01	0.03	0.07	0.08	0.14	0.04	0.00	0.01
56	0.291	0.13	0.02	0.00	0.21	0.03	0.12	0.03	0.16	0.08	0.09
64	0.008	0.18	0.02	0.01	0.29	0.02	0.09	0.00	0.08	0.09	0.06
72	0.016	0.03	0.03	0.03	0.03	0.03	0.00	0.00	0.06	0.08	0.18
80	0.032	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
88	0.015	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
96	0.008	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Sum	0.38	0.61	0.35	0.39	0.74	0.35	0.44	0.32	0.48	0.65	0.54

Figure 3.7 illustrates the distribution of vehicle activities across the speed ranges. Both papers by Hallmark and Guenslar (1999a, 1999b) present the same data for the field data and NETSIM results. The results indicate that INTEGRATION overestimates the proportion of time that vehicles spend at speeds greater than 32 km/h and underestimate the time associated with speeds less than 32 km/h.

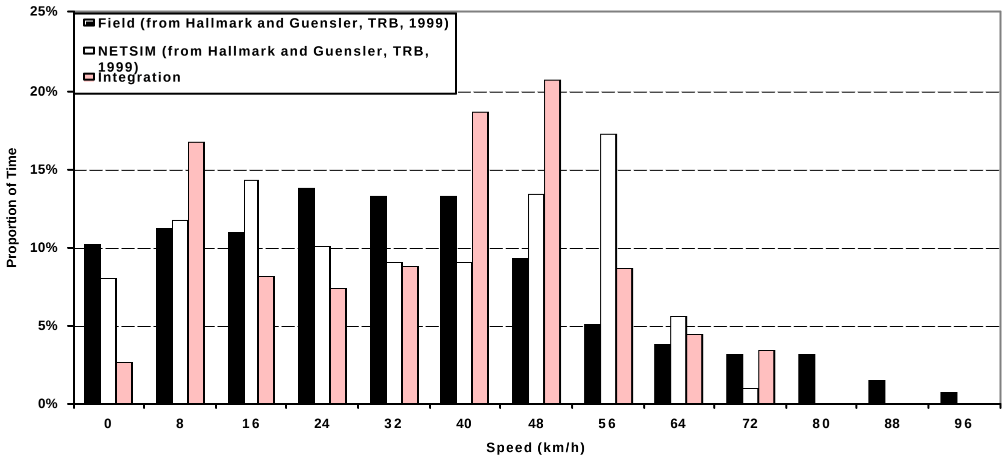


Figure 3.7 - Comparison of time spent in each speed range

3.1.6 Conclusions

The results obtained from a comparison of predicted and observed speed and acceleration data support two conclusions.

First, both NETSIM and INTEGRATION appear to provide similar levels of overall accuracy in modeling the microscopic acceleration and speed behaviour of vehicles at signalized intersections. Second, while both models provide distributions of speed and acceleration that reflect general trends in observed conditions, there remain discrepancies between the models' predictions and field data as collected and described by Hallmark and Guenslar. Unfortunately, it is not possible to make conclusions regarding the source or cause of these discrepancies. They may be a result of the modeling logic employed within NETSIM and INTEGRATION. Conversely, they may result from inadequate specifications of field conditions within the simulation models. In fact, the field data collected by Hallmark and Guenslar were obtained from up to 30 different intersection sites, and data collected for a random sample of vehicles at each site. The data set used for comparison to the simulation models was composed of data from several different field sites having similar level of service.

3.2 Average Delay at Signalized Intersections

The second area of the simulation model behaviour to be examined was its prediction of average vehicle delay caused by traffic signals. The consistency of delay estimates between various analytical delay estimation methods and INTEGRATION was determined for the intersection illustrated in Figure 3.8. Average vehicle delay was estimated using INTEGRATION and the analytical models of the Canadian Capacity Guide (Teply, 1994) and the Highway Capacity Manual (TRB, 1994). The network consists of single intersection approach controlled by a fixed-time signal. Delays were compared for different traffic demands and signal timings. An approach link length of one km was used in the simulation.

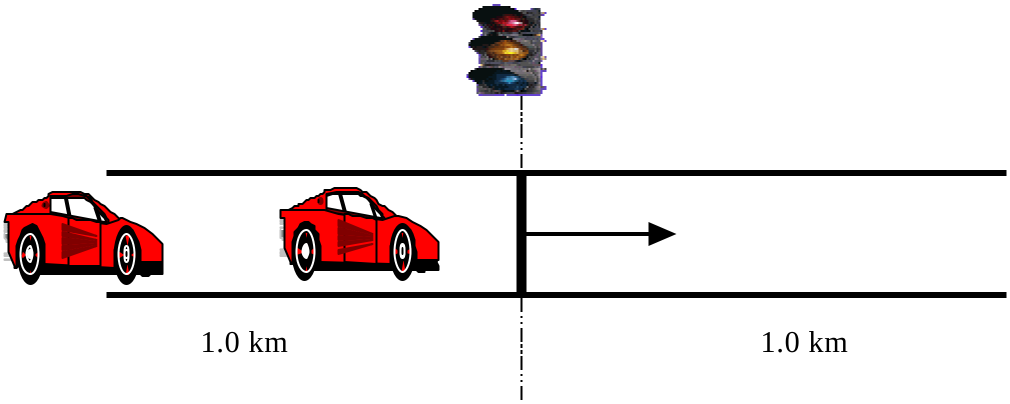


Figure 3.8 - Test intersection for delay comparison

Delay experienced by a vehicle approaching a signalized intersection approach is defined as the difference between the travel time required for the vehicle to traverse the approach link and the intersection, and the travel time that would have been experienced by the same vehicle in the absence of the traffic signal. Therefore, each traffic demand condition was simulated twice, once with a signal and once without. Average vehicle delay was computed as the (total travel time for all vehicles when the signal is considered – total travel time with no signal) divided by the total number of vehicles simulated. The purpose for comparing delay estimates from INTEGRATION to other methods is to ensure that the impact of traffic signals on vehicle delay is appropriately modelled.

3.2.1 Analytical Delay Models

This section describes two popular delay estimation models developed for the Highway Capacity Manual (HCM) (TRB, 1994) and the Canadian Capacity Guide (CCG) (Teply et al, 1985) that are used to verify results obtained from INTEGRATION.

The procedure described in the Hcm for computing the total average delay is defined by Equations 3.2 to 3.4 (William, et al., 1998).

$$D ? d_1 ? d_2 \tag{3.2}$$

$$d_1 ? 0.38C ? [(1 ? g / C)^2 /(1 ? (g / C) ? X)] \tag{3.3}$$

$$d_2 ? 900 ? X^2 ? [(X ? 1) ? \sqrt{(X ? 1)^2 ? (4 ? X / c)}] \tag{3.4}$$

where:

D = Average overall vehicle delay (s/pcu)
$d1$ = Average overall uniform delay (s/pcu)
$d2$ = Average overflow delay (s/pcu)
C = Cycle length (sec)
c = Capacity of lane (pcu/hr)
g = Effective green time (sec)
X = Degree of saturation (ratio of arrival flow rate to capacity)

The Canadian Capacity Guide computes the total delay at an intersection using Equations 3.5 to 3.7 (Teply, 1994).

$$D ? K_f ? d_1 ? d_2 \tag{3.5}$$

$$d_1 ? C ? (1 ? g / C)^2 / 2(1 ? x_1 ? g / C) \tag{3.6}$$

$$d_2 ? 15 ? te ? [(X ? 1) ? \sqrt{(X ? 1)^2 ? 240 ? X / c ? te}] \tag{3.7}$$

Where:
d_1 = average overall uniform delay (s/pcu)
d_2 = average overflow delay (s/pcu)
C = cycle time (sec)

g = effective green interval (s)

x_1 = minimum of (1.0, X)

X = degree of saturation (pcu/h)

c = capacity (pcu / h)

t_e = evaluation time (min)

K_f = adjustment factor for the effect of the quality of progression.(K_f = 0, for isolated intersections)

3.2.2 Comparison of Delay Estimates

Figure 3.9 illustrates the results of the delay estimations carried out for the test intersection scenario described earlier. The delay obtained from INTEGRATION is in this case the average of the delays reported by five replications of the test intersection example. Replications were made to account for stochastic variability of the simulation process.

The results provided in Figure 3.9 indicate that the delay calculated from the CCG and HCM equations produce similar estimates for the range of traffic conditions examined. The INTEGRATION model produces higher delay estimates particularly, for X values greater than 0.9.

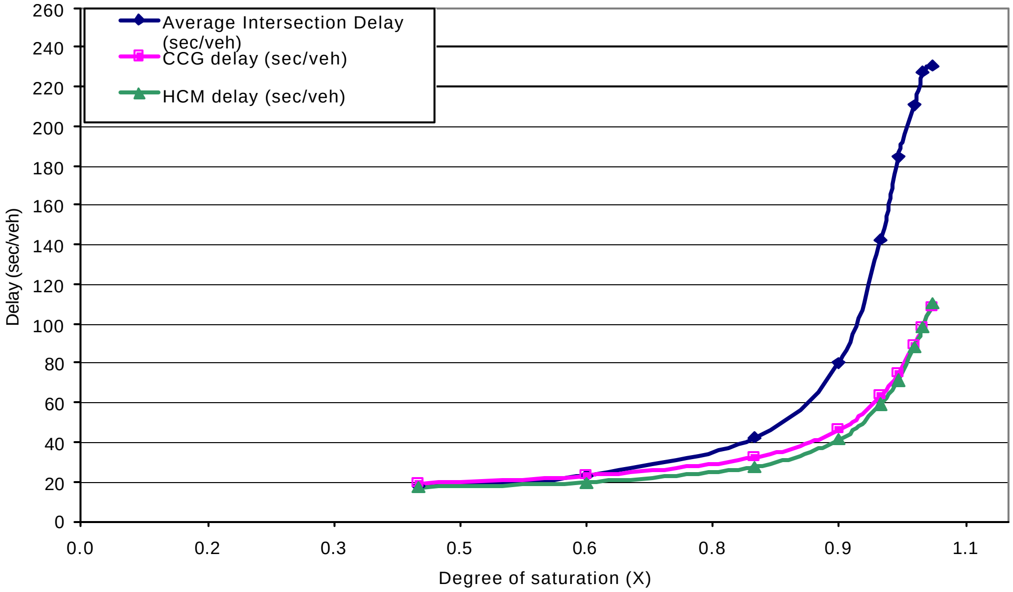


Figure 3.9 - Overall delay estimates

This result is comparable to the results obtained by Rakha, et al (2000) in which the differences in results have been attributed to two factors. First INTEGRATION computes the delay associated with constrained vehicle deceleration and acceleration, however the analytical approaches assume instantaneous unconstrained vehicle deceleration and acceleration levels. Second, INTEGRATION unlike the analytical queuing models and shockwave analysis, captures the discrete nature of flow. Consequently, the delay estimate computed by INTEGRATION is sensitive to the departure times of the vehicles.

3.3 Emission Submodels

This section examines the microscopic emissions models that are embedded within the INTERGRATION model. The emission models have been described in detail by Ahn et al (1999) and Rakha et al (2000). A brief discussion is provided here to present the degree to which these microscopic emission models reflect field data. The emission models embedded within INTEGRATION were developed on the basis of measurements collected at the Oak

Ridge National Lab (ORNL). Second by second measurements were made of fuel consumption and tail pipe emissions of hydrocarbon (HC), carbon monoxide (CO) and oxides of nitrogen (NOx) for various vehicle speed and acceleration levels.

The ORNL test vehicles were selected to be representative of a typical 1995 U.S. light-duty vehicle fleet on the basis of their weight and engine size. Vehicles ranged in model year from 1988 to 1995. For each vehicle, information about steady-steady pollutant emissions was collected with a dynamometer by testing the vehicle at different running speeds and under various accelerating conditions. Data were typically collected for speeds ranging from 0 to 120 km/h and for accelerations ranging from -1.5 to 3.7 $\mathrm{m/s^2}$. The tests yielded between 1300 and 1600 data points for each test vehicle. The ORNL data did not include high emitting vehicles and only considered vehicles tested under hot stabilized conditions. Eight light duty gasoline vehicles were tested on a vehicle dynamometer. The ORNL data that were used to develop the microscopic fuel consumption and emission relationships provided steady-state energy and emission data the eight light-duty vehicles and a composite vehicle exhibiting the average characteristics of the eight test vehicles (Ahn, et al., 1999).

Separate models were developed for CO, HC, and NOx. Each model is a multivariate non-linear third degree model of the form shown in Equation 3.8

$$\log Z_k = \sum_{i=0}^{3} \sum_{j=0}^{3} B_{ij}^{k} u^{i} a^{j} \quad ?\; k \qquad (3.8)$$

where:

Z_k = estimated quantity of emission (g/sec)

B_{ij}^{k} = regression coefficient for speed range *i*, acceleration range *j* and emission *k*

u^i = vehicle speed (km/h)

a^j = vehicle acceleration (kph/s)

Regression models of the general form of Equation 3.8 were fit to the composite emission data for each of the three emissions. The models explained more than 90% of the variance observed in the composite emissions indicating a high degree of explanatory power. However, it must be noted that these relationships do not consider the impacts of cold starts, high emitting vehicles, or heavy vehicles. Also these models cannot be applied beyond the vehicle speed and acceleration boundaries that were used in the their calibration.

Chapter 4

DEVELOPMENT OF ANALYTICAL EMISSION & FUEL CONSUMPTION MODELS

4.1 Development of Analytical Emission Model

The INTEGRATION simulation model was used to generate emission and fuel consumption data for a range of traffic and signal control conditions. These data were then used to calibrate regression models for estimating vehicle tailpipe emissions as a function of signal timing parameters and traffic conditions.

4.2 Data Generation

A total of 8100 scenarios were simulated using the INTEGRATION model. In each case the network consisted of a single lane approach to an isolated intersection. The approach was 1.0 km long and controlled by a fix-time two-phase traffic signal (Figure 4.1).

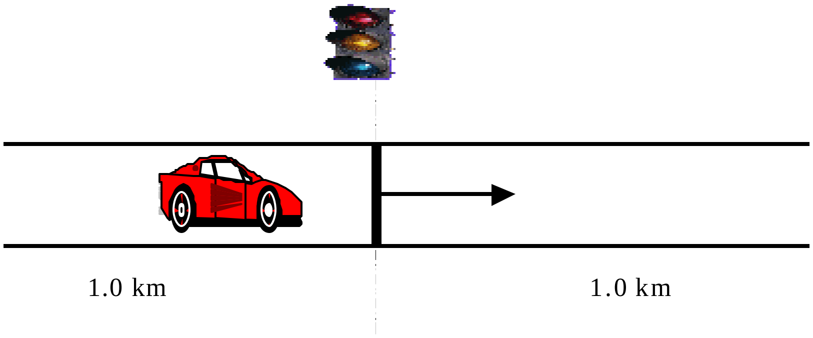


Figure 4.1 - Intersection used for model calibration

Traffic demands were generated on the eastbound approach with exponentially distributed time headways over a 60-minute time period. The simulation was permitted to continue until all vehicle trips had been completed. The unadjusted saturation flow rate was assumed to be 1800 vph. Average emissions of CO, HC, and NOx per vehicle, as predicted by the emissions sub-models within INTEGRATION model, were recorded for each scenario. Average fuel consumption for each vehicle was also recorded.

Each of the 8100 scenarios reflected a different combination of signal control parameters, traffic demand, link speed conditions, and random number generator seed. Parameter values and combinations are provided in Table 4.1.

Table 4.1 - Parameter value combinations used for data generation

Parameter	No.	Values
Link Speed (km/h)	12	$\{S_f, S_c\}$= {(80,75), (80,70), (80,60), (70,65), (70,60),(60,55),(60,50),(60,40),(50,45), (50,40), (70,50),(50,30)}
Cycle length	5	{C} = {60, 75, 90, 105, 120}
g/c ratio	3	{g/C} = {0.3, 0.5, 0.7}
Degree of Saturation	9	{X} = {0.4,0.6,0.8,0.9,0.95,0.97,0.99,1.0,1.01}
Random Seed	5	{R} = {1, 2, 3, 4, 5}

These 8100 scenarios were also executed without the traffic signal for the same traffic demand, link speeds, and random seed combinations. The resulting emission data was compiled by subtracting the average vehicle emission (or fuel consumption) associated with a non-signal scenario from the corresponding average vehicle emission (or fuel consumption) associated with the traffic signal. This quantity represented the additional average emission quantity that would be produced by each vehicle traversing a single approach as a result of the direct installation of a traffic signal. The resulting emission data for all scenarios associated with random seed 1 are provided in Appendix A.

4.2.1 Analytical Model Calibration

Emission models were developed by calibrating regression models to the generated emission data. A variety of model structures were considered including first and second order linear models, and first and second order exponential models. The exponential models, having the general structure as in Equation 4.2, were selected on the basis of their superior explanatory powers.

$$E = e^{a} \times e^{b_1 Z_1^{n_1}} \times e^{b_2 Z_2^{n_2}} \cdots \times e^{b_m Z_m^{n_m}} \qquad (4.2)$$

where:

E = additional quantity of pollutant emitted as a result of signal (kg)

a = regression constant

b_m = regression coefficient associated with independent variable m

Z_m = independent variable m (e.g. X, C, Sf, Sc, etc.)

n_m = exponent for independent variable m

In each case a step-wise regression method was adopted to formulate the models. In this method independent variables are incorporated into or removed from the regression model on the basis of their individual contribution to the amount of variance in the dependent variable that is explained by the regression model in single steps from best to worst. The variable that explains the greatest amount of variation in the dependent variable is entered first. The variable that explains the greatest amount of variation in conjunction with the first is entered second and so on. The software package SPSS version 10.0 was used to carry out this process.

The F-test was used to decide whether an independent variable made a significant contribution to the model's ability to explain the variance observed in the data. A level of significance of 5% was chosen for adding independent variables to the model. A level of significance of 10% was chosen for removing variables.

The statistical model associated with the step-wise development of the emission regression models is provided in Table 4.2.

Table 4.2 - Step-wise regression model development results

Carbon Monoxide						
Model	Adjusted R^2	Std. Error of the Estimate	Change Statistics			Predictors
			R^2 Change	F Change	Sig. F Change	
1	.807	.4428	.807	33923	.000	S_f
2	.897	.3239	.090	7039	.000	S_f, X
3	.927	.2721	.030	3377	.000	S_f, X, S_c
4	.952	.2208	.025	4204	.000	S_f, X, S_c, c
5	.953	.2182	.001	192	.000	S_f, X, S_c, c, g/c
Hydrocarbon						
Model	Adjusted R^2	Std. Error of the Estimate	Change Statistics			Predictors
			R^2 Change	F Change	Sig. F Change	
1	.780	.5363	.780	28681	.000	S_f
2	.888	.3819	.109	7873	.000	S_f, X
3	.909	.3440	.021	1886	.000	S_f, X, S_c
4	.922	.3197	.012	1274	.000	S_f, X, S_c, c
5	.922	.3185	.001	61	.000	S_f, X, S_c, c, g/c
Nitrogen Oxide						
Model	Adjusted R^2	Std. Error of the Estimate	Change Statistics			Predictors
			R^2 Change	F Change	Sig. F Change	
1	.541	.4882	.541	9480	.000	X
2	.729	.3748	.189	5610	.000	X, S_c
3	.746	.3632	.016	521	.000	X, S_c, c
4	.753	.3580	.007	235	.000	X, S_c, c, g/c
5	.756	.3561	.003	90	.000	X, S_c, c, g/c, S_f

For each pollutant type Table 4.2 provides the evolution of the regression model. For each model a number of descriptive statistics are provided. The adjusted R^2 reflects the proportion of total variation in the dependent variable that is accounted for by the independent variables adjusted for the number of independent variables and is calculated from Equation 4.3.

$$R^{2}_{adj} \ ?\ 1\ ?\ (1 ?\ r^{2})\ ?\ [n - 1/n\text{-}k\ \text{-}1] \qquad (4.3)$$

where:

R^{2}_{adj} = adjusted coefficient of determination

r^2 = coefficient of determination
n = number of observations
k = number of independent variables

The standard error of the estimate represents the "scatter" of the data around the estimated regression line. The regression line seeks to minimize the sum of the squared errors of prediction. The square root of the average squared error of prediction is used as a measure of the accuracy of prediction. This measure is called the standard error of the estimate and is computed from Equation 4.4.

$$S_e = \sqrt{\sum (y-\hat{y})^2 / N} \qquad (4.4)$$

where:

S_e = standard error of estimate
y = actual values
$\hat{y}$ = predicted values
N = number of observations

The change statistics reflect the change in the explanatory power of the regression model as a consequence of adding a new prediction variable.

F change is the change in the F-statistics from the previous model to the current model. The R^2, being the proportion of variation explained by the variable included in the regression equation reflects the overall accuracy of each of the prediction equations. The higher the R^2 value, the better that the variation in the observed data can be explained by the prediction equation.

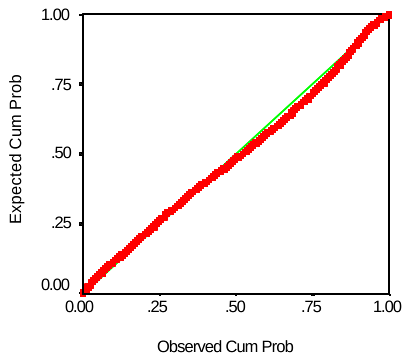
On the basis of the step-wise regression results provided in Table 4.2, regression models were selected for each emission type. For each emission, the final step-wise model was selected as all independent variables are statistically significant and the model provided the greatest explanatory power. The regression coefficients for each selected model are provided in Table 4.3.

Table 4.3 – Regression model coefficients

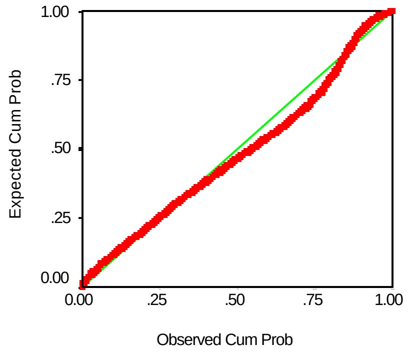
Model		Coefficients		Student t
		b_i	Std. Error	
CO	(Constant)	-5.687	.022	-256.7
	S_f	0.0529	.000	118.8
	X	1.506	.012	124.5
	S_c	0.0282	.000	72.5
	c	-0.00750	.000	-65.6
	g/c	-.206	.015	-13.9
HC	(Constant)	-8.703	.032	-269.1
	S_f	0.0637	.001	97.9
	X	1.877	.018	106.4
	S_c	0.0266	.001	46.9
	c	-0.00598	.000	-35.8
	g/c	-0.170	.022	-7.8
NO_x	(Constant)	-6.307	.036	-174.2
	S_f	0.00689	.001	9.5
	X	2.630	.020	131.8
	S_c	0.0194	.001	30.4
	c	-0.00436	.000	-23.3
	g/c	0.375	.024	15.4

An examination of the residuals in Figure 4.2 indicates that for the CO and HC models, the residuals are near-Normally distributed with no apparent significant changes in variance.

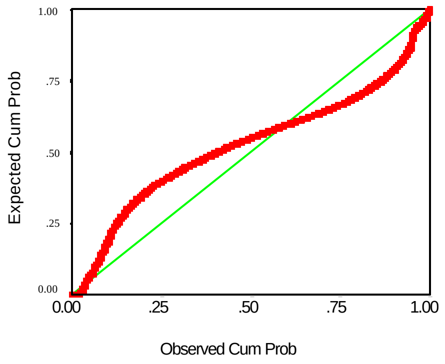
(CO Model)



(CO Model)



(HC Model)



(NOx Model)

Figure 4.2 - Cumulative probability plots of Normalized residuals for the emission regression models

The residuals associated with the NOx model are not as well behaved.

Figure 4.3a, 4.3b, and 4.3c illustrate the estimated emission versus the emission obtained from the simulation for all 8100 scenarios.

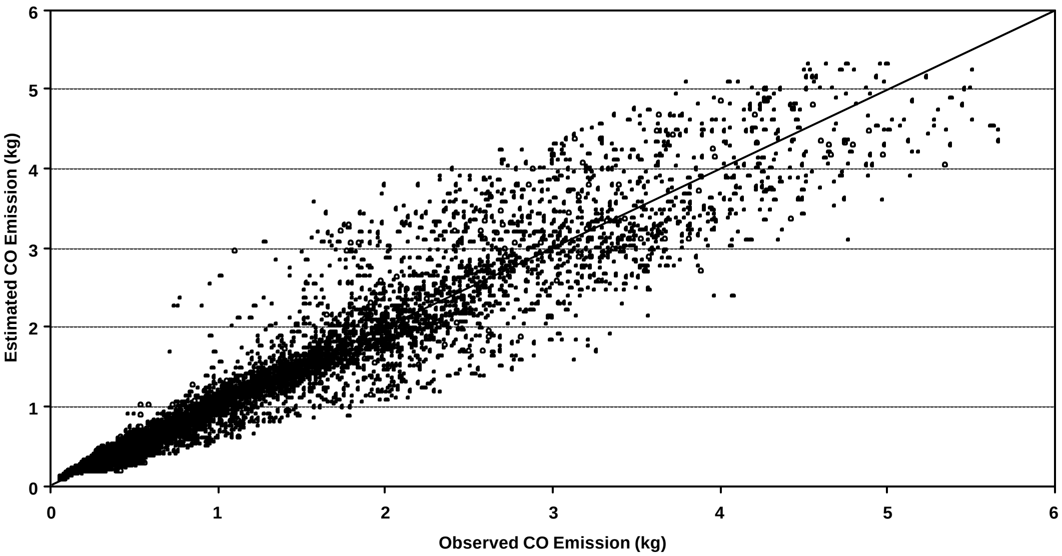


Figure 4.3a - Comparison of estimated and observed CO emission

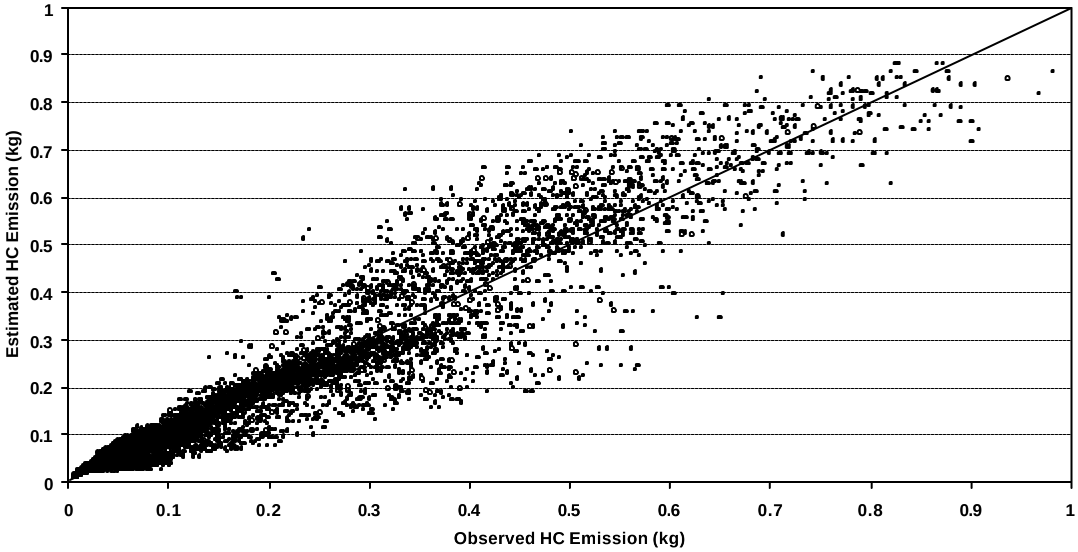


Figure 4.3b - Comparison of estimated and observed HC emission

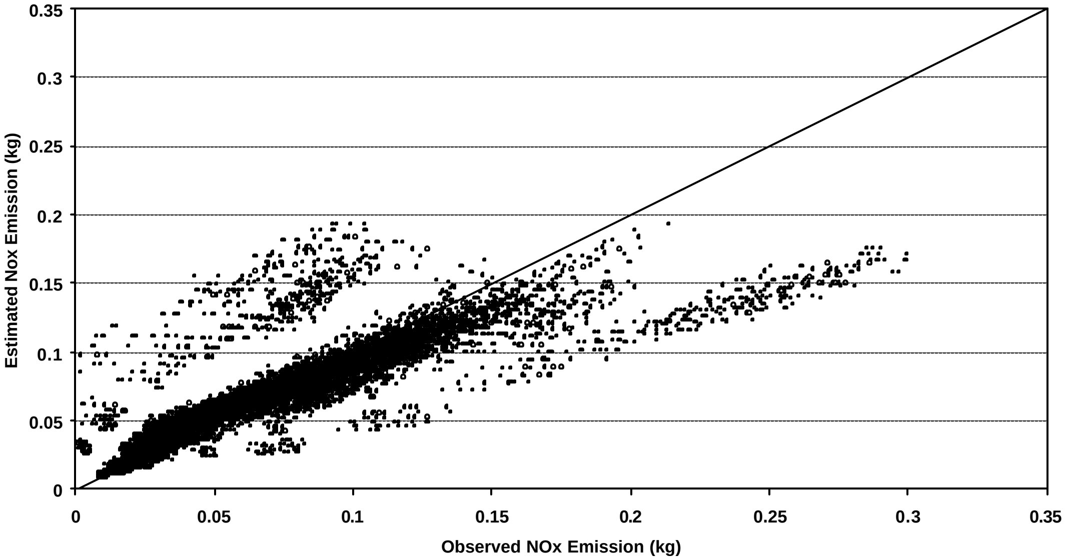


Figure 4.3c - Comparison of estimated and observed NOx emission

These figures also indicate that the regression models for CO and HC explain a large portion of the observed variance. However, for NOx, Figure 4.3 c, indicates two distinct regions of large estimation error (one associated with over estimation and the other with under estimation) implying that the regression model for (NOx) fails to capture at least one causal factor. A number of other model structures using the set of available explanatory variables were examined for NOx, however, a model with greater explanatory power was not found.

4.3 Comparison of proposed emission models to existing techniques

A review of the literature was conducted to identify other analytical models for estimating emissions with the intent of comparing these models with the models proposed in this thesis. The literature review revealed that very little work has been done previously to develop analytical emission models that explicitly include signal-timing parameters as independent variable. One notable emission model that does provide emission estimates as an indirect function of signal timing parameters is the model proposed in the 2nd Edition of the Canadian Capacity Guide (Teply, 1995). This model estimates CO, HC, and NOx, as a function of the number of stops and average stopped delay which must first be estimated from the traffic demands and signal control parameters.

The background of the derivation of the model proposed in the CCG is not available in the literature, although personal communication with Prof. Stan Teply, the editor of the CCG, revealed that the model is based on results obtained from the Mobile 4 model developed by the US EPA.

4.3.1 Comparison scenario

A single scenario was used to compare the results from the CCG with those obtained from the proposed regression models. The hypothetical scenario consists of a 4-leg single lane intersection approach, with a base saturation flow rate of 1800 vph. A single cycle length of 90 seconds and a g/c ratio of 0.5 are assumed. An average cruise speed of 50 km/h is assumed for application of the CCG method. The scenario represents an isolated intersection so no progression adjustments are made. A free speed (S_f) of 65 km/h and a speed at capacity (S_c) of 55 km/h are assumed for application of the regression models. Traffic demands are applied to the network for 1 hour and the simulation is run until all the vehicles have completed their trip. An evaluation time period (t_e) of 60 minutes is used in the CCG model. Emission estimates were made for 11 values of X, ranging from 0.4 to 1.01. The resulting emission estimates represent the additional emission that would result from the impact of the traffic signal. Therefore, emissions resulting from cruising (i.e. the last term of the CCG model) are ignored.

4.3.2 Results

The results are illustrated in Figures 4.4a, 4.4b and 4.4c for CO, HC, and NOx. From these figures it is evident that the CCG models are much more sensitive to the degree of saturation than are the proposed regression models. The sensitivity results in estimates of emissions that are as much as 10 time greater than the estimates from the proposed models. The estimates from the CCG for a 1995 vehicle fleet and a 2000 vehicle fleet follow the same trend, with the year 2000 fleet producing marginally lower emissions (in the range of 5% for CO, 14% for HC and 17% for NOx).

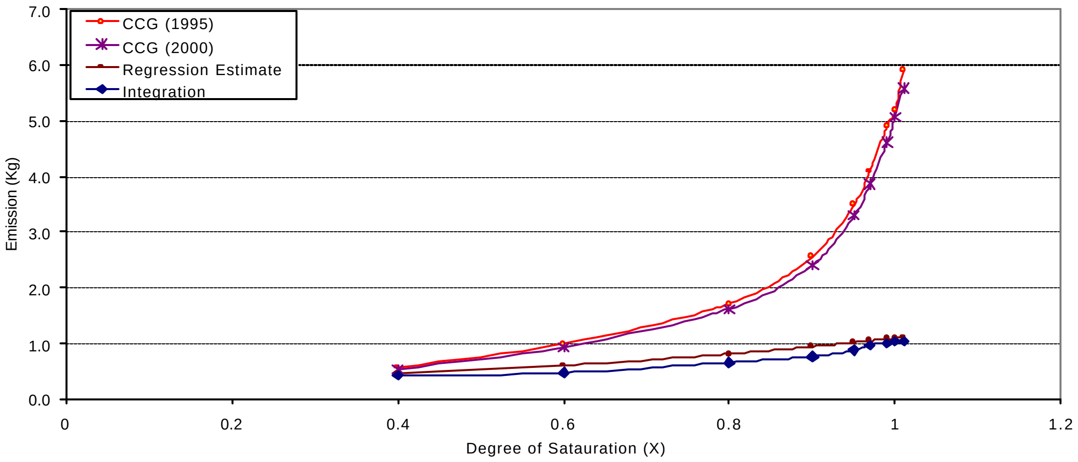


Figure 4.4a - Carbon monoxide emission comparison

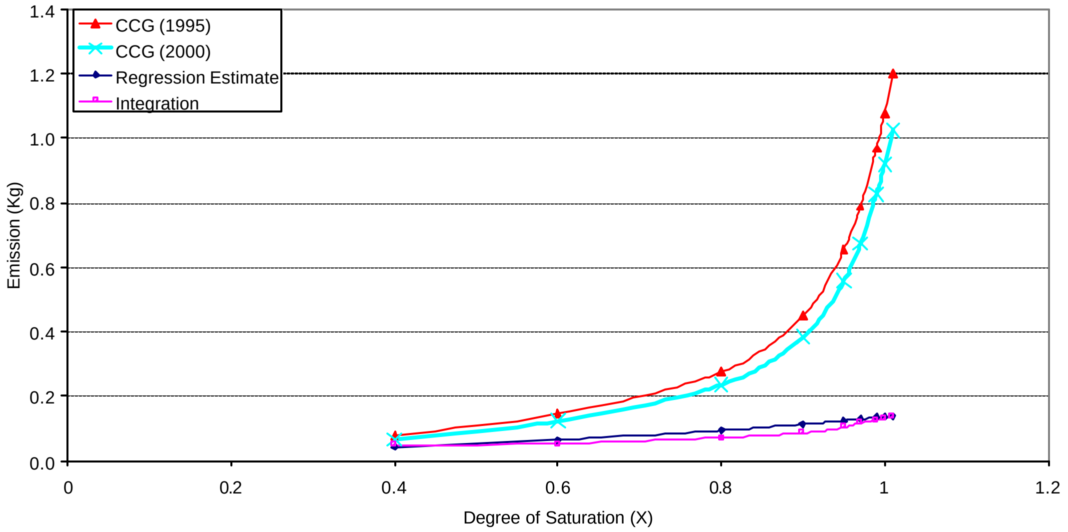


Figure 4.4b - Hydrocarbon emission comparison

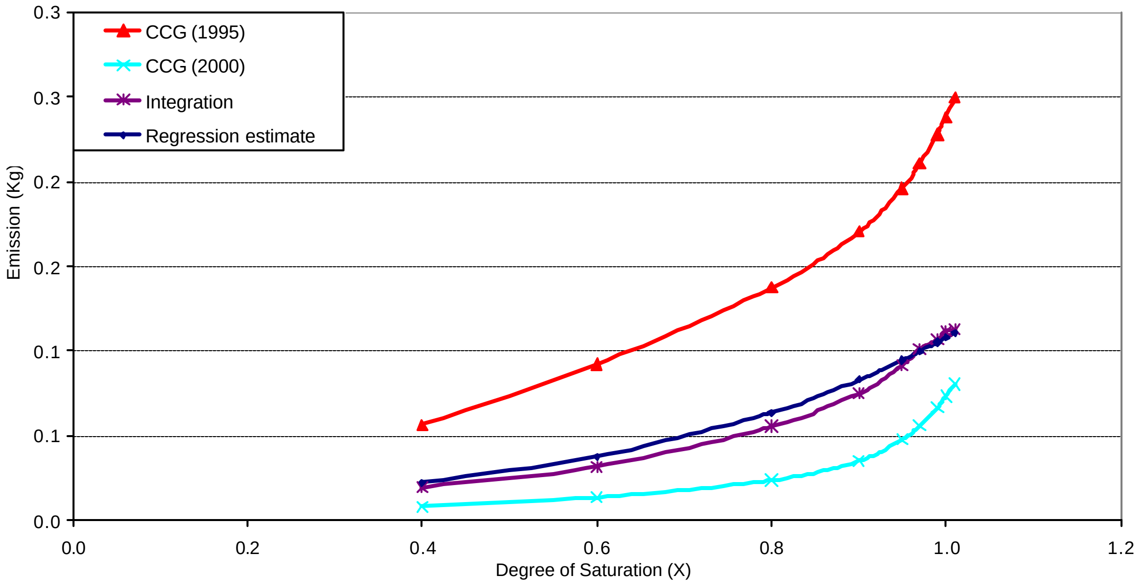


Figure 4.4c - Nitrogen oxide emission comparison

The most significant result is that unlike the CCG models, the proposed models indicate that emissions increase rather slowly with increase in the degree of saturation. For a degree of saturation equal to 1.0, the proposed models indicate that emissions range from 2.5 (CO) to 4.9 (NOx) times the emissions at a degree of saturation of 0.4. Conversely, the CCG models indicate that at $X = 1.0$ emissions are 7 (NOx) to 16 (HC) times the emissions at $X = 0.4$.

Unfortunately, it is not possible to assess the validity of the CCG models as the derivation of the models has not been described in the literature. The evidence provided in this research in support of the validity of the proposed models seems to indicate that the CCG models may significantly over estimate emissions for a wide range of typical signalized intersection operating conditions.

4.4 Fuel Model Development

The method adopted for the development of the fuel consumption model was similar to that used in the development of the emission models. The INTEGRATION simulation model was used to generate fuel consumption data for a range of traffic and signal control conditions. The same 8100 scenarios used for emission model development were used for the development of the fuel consumption model.

The resulting fuel consumption data was compiled by subtracting the average vehicle fuel consumption associated with a non-signal scenario from the corresponding average vehicle fuel consumption associated with the traffic signal. This quantity reflects the additional average fuel that would be produced by each vehicle traversing a single approach as a result of the installation of a traffic signal.

The same Step-wise regression method and exponential model structure (Equation 4.5) was adopted as used in the development of emission models.

$$F \,?\, e^{a} \,?\, e^{b_1 Z_1^{n_1}} \,?\, e^{b_2 Z_2^{n_2}} \square \,?\, e^{b_m Z_m^{n_m}} \qquad (4.5)$$

where:

F = fuel estimate (litres)

a = regression constant

b_m = regression coefficient associated with independent variable m

z_m = independent variable m (e.g. X, C, Sf, Sc, etc.)

n_m = exponent for independent variable m

4.4.1 Results

The result of the fuel consumption regression equation is shown in Table 4.4. On the basis of the step-wise results provided in Table 4.4, the final step-wise regression model (model 5) was selected. The regression coefficients for this model are provided in Table 4.5.

Table 4.4 – Fuel consumption regression model

Fuel						
Model	Adjusted R^2	Std. Error of the Estimate	Change Statistics			Predictors
			R^2 Change	F Change	Sig. F Change	
1	.752	.4493	.752	24064	.000	X
2	.783	.4206	.031	1119	.000	S_c, X
3	.785	.4187	.002	73	.000	X, S_c, g/c
4	.786	.4175	.001	46	.000	S_f, X, S_c, g/c
5	.787	.4168	.001	27	.000	S_f, X, S_c, c, g/c

Table 4.5 – Fuel consumption regression model coefficients

		Coefficients		Student t
Model		b_i	Std. Error	
Fuel	(Constant)	-.610	.043	-14.31
	S_f	-0.005812	.001	-6.827
	X	3.919	.024	165.414
	S_c	0.01714	.001	22.756
	c	0.001146	.000	5.194
	g/c	.247	.029	8.609

4.4.2 Comparison of proposed fuel model to CCG fuel model

The same single scenario that was used in emission comparison was used to compare results from the CCG with those obtained from the proposed fuel regression model. The results are shown in Figure 4.5.

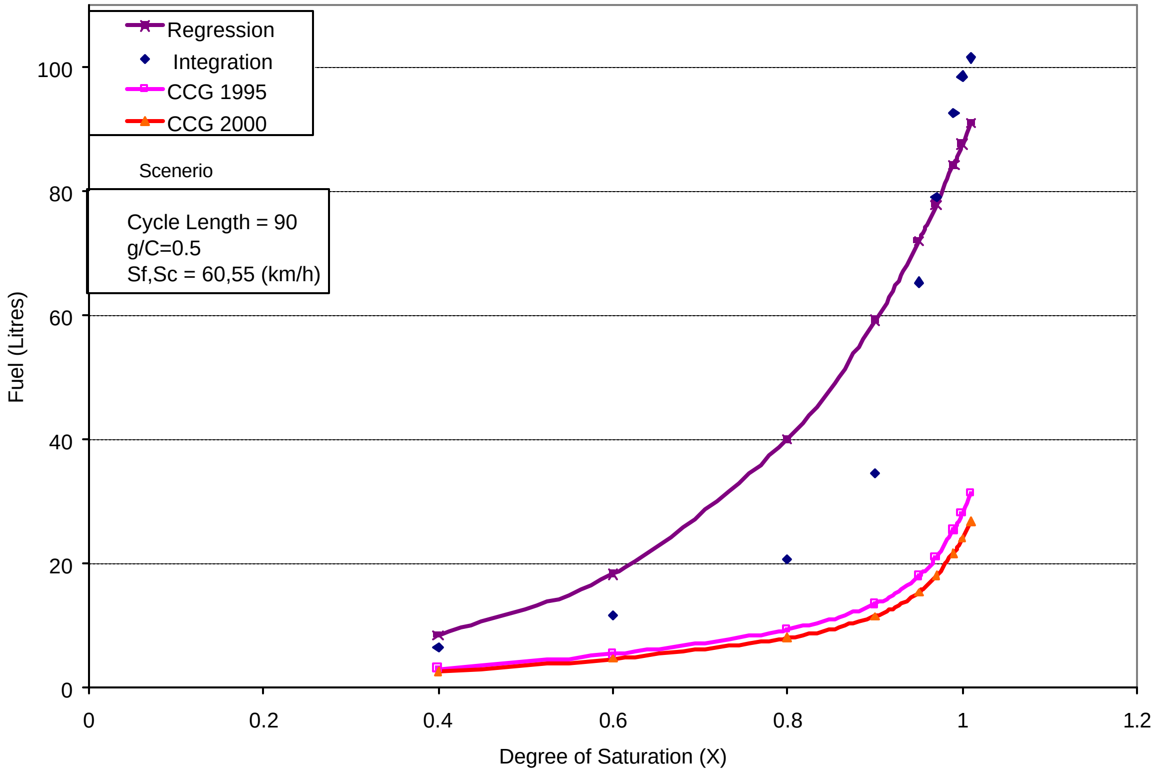


Figure 4.5 - Comparison of regression fuel model to CCG fuel model

From the figure it is clear that the regression model is much more sensitive to the degree of saturation than is the CCG model. The estimates from the CCG for a 1995 vehicle fleet and a 2000 vehicle fleet follow the same trend, with the year 2000 fleet consuming marginally lower fuel. The most significant result is that unlike the CCG models, the proposed model indicates that fuel consumption increases rather rapidly with an increase in the degree of saturation. Unfortunately, it is not possible to assess the validity of the CCG fuel model as the derivation of the model has not been described in the literature. The evidence provided in this research in support of the validity of the proposed fuel model seems to indicate that the CCG model may significantly under estimate fuel consumption for a wide range of typical signalized intersection operating conditions.

Chapter 5
IMPLICATIONS FOR SIGNAL DESIGN

In general, practitioners have often assumed that implementation of the cycle length that minimises average vehicle delay will also result in the minimization (or at least near minimisation) of emissions and fuel consumption. In this chapter, we examine the validity of this assumption using the emission and fuel consumption models developed in the previous chapter.

5.1 Description of Intersection Scenario

The intersection examined for analysis is a typical 4-leg intersection (Figure 5.1). All approaches consist of a single lane with an unadjusted saturation flow rate of 1800 vph. Traffic demands were specified as 600 vehicles per hour (vph) for eastbound, 800 vph for westbound, 400 vph for northbound and 300 vph southbound. No turning movements were considered. An evaluation period of 60 minutes was assumed. Random vehicle arrivals are assumed.

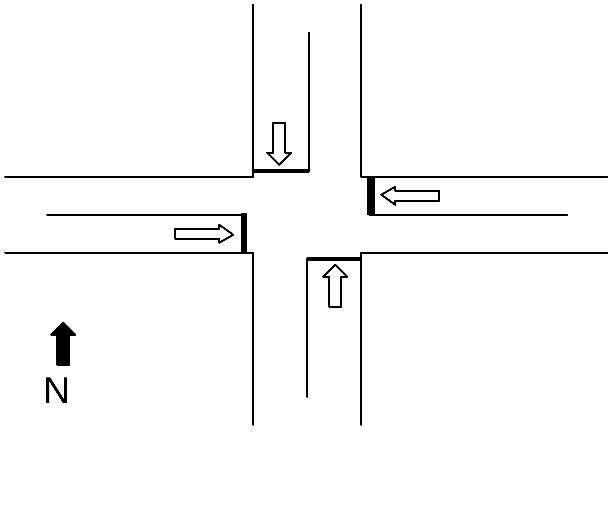


Figure 5.1 - Test intersection for implication of signal design analysis

5.2 Results

The CCG method was used to determine the average vehicle delay for cycle lengths ranging from 35 to 122 seconds in 3 seconds increments. A loss time of 5 seconds per phase was assumed. For each cycle length available green time was apportioned to each phase according to the critical flow ratio. For this particular network, the calculation of the critical flow ratio is quite simple. The flow ratios for northbound and southbound are y = 400/1800 = 0.222 and y = 300/1800 = 0.167, respectively. The critical flow ratio is the maximum flow ratio of those approaches discharging in the phase under examination. Thus, the critical flow ratio for phase 1 serving northbound and southbound approaches is 0.222.

Similarly, in phase 2 (serving eastbound and westbound traffic) the critical flow ratio is 800/1800 = 0.444. Thus, for this specific example, available green time is apportioned in the ratio of 0.444/(0.444+0.222) = 2/3 for eastbound and westbound approaches and 1/3 for northbound and southbound approaches. Having apportioned green time to each phase, Equations 3.5, 3.6, and 3.7 were used to compute average delay on each approach. The average vehicle delay for the intersection was computed as the volume weighted average of the average delay on each approach. The optimum cycle length was estimated using the equation for optimal cycle length in the CCG (Equation 5.1). Assuming a lost time of 5 sec for each phase and intersection flow ratio of 0.444+0.222 = 0.666, C_{opt} was calculated as 60 sec.

$$C_{opt} \; ? \; [1.5L \; ? \; 5]/(1 \; ? \; Y) \qquad (5.1)$$

where:

C_{opt} = optimum cycle time (sec)

L = intersection lost time (sec)

Y = intersection flow ratio

The CCG emission model and regression emission models developed in this study were used to estimate the additional quantity of CO, HC and NOx emitted for each cycle length (35-122 sec).

The results are illustrated in Figures 5.2 - 5.5. In each figure, 3 quantities are depicted, namely CCG average vehicle delay, CCG emission (or fuel), and emission (or fuel) predicted from the models developed in this thesis.

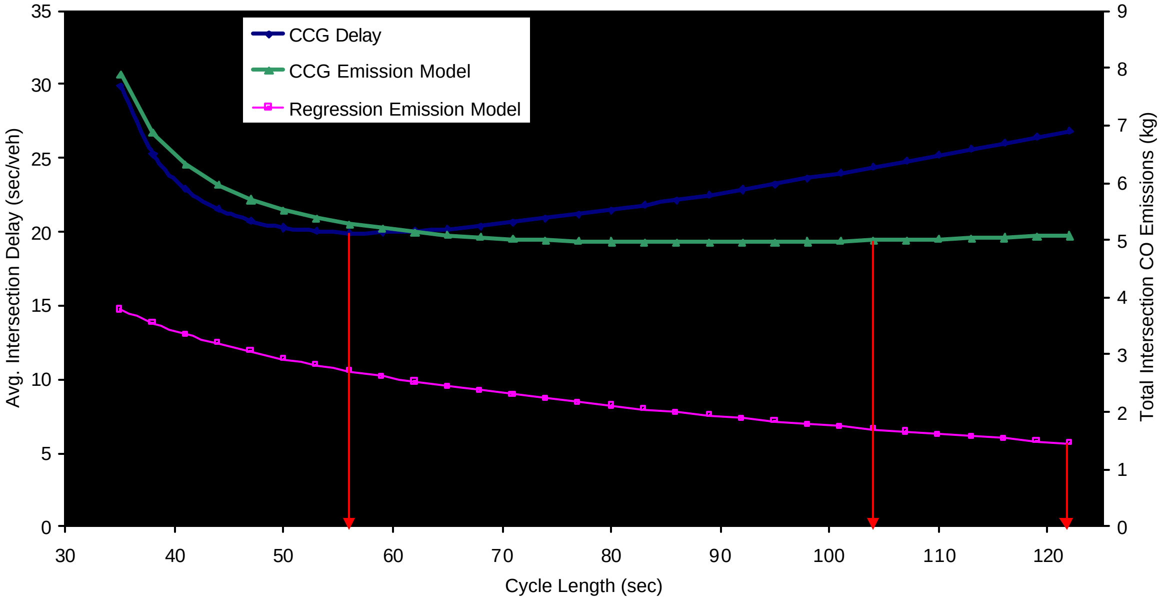


Figure 5.2 - CO and Delay as a function of cycle length

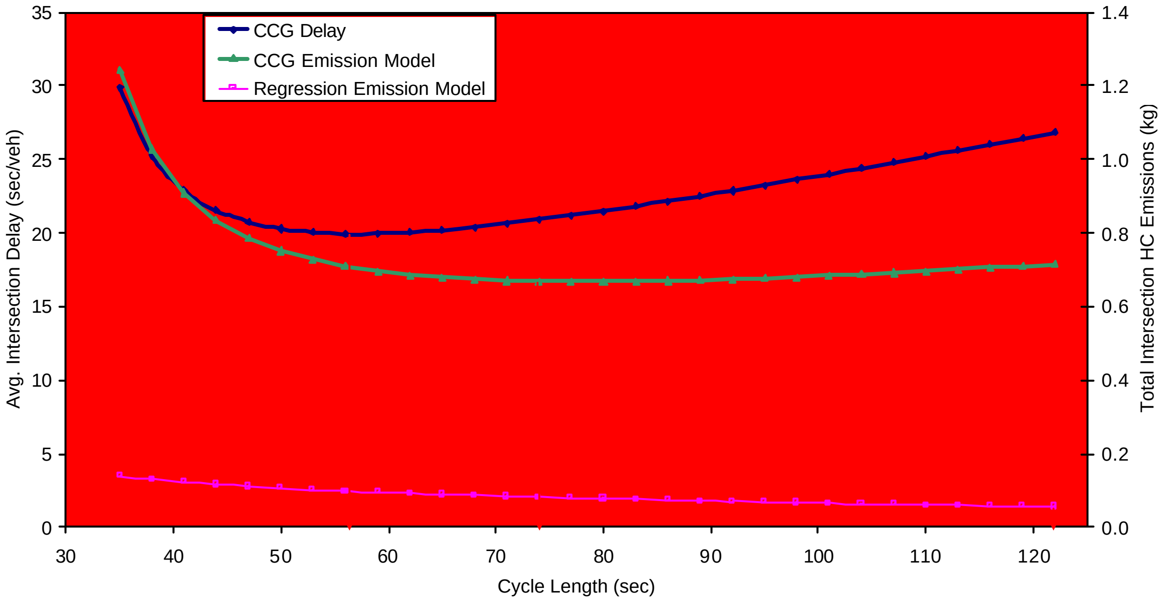


Figure 5.3 - HC and Delay as a function of cycle length

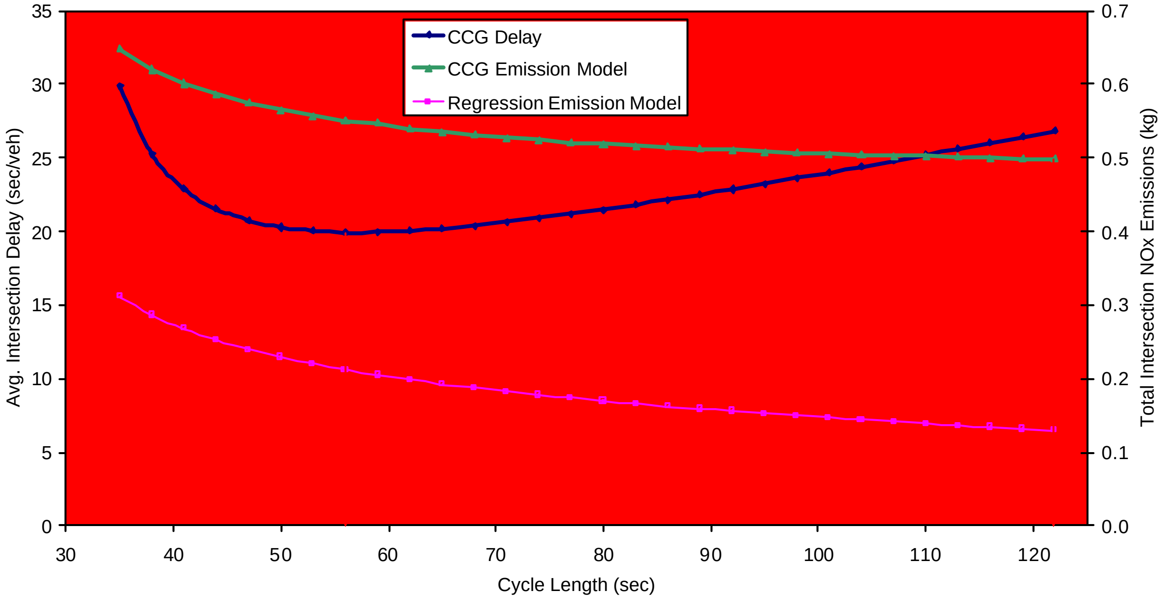


Figure 5.4 - NOx and Delay as a function of cycle length

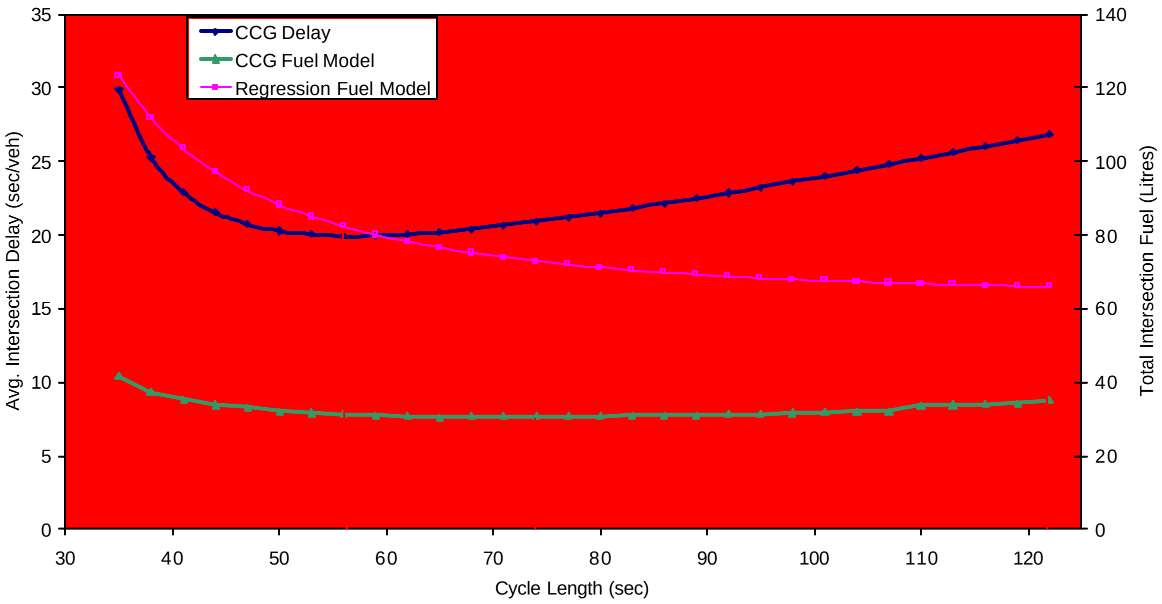


Figure 5.5 - Fuel and Delay as a function of cycle length

It can be seen that in all four figures, average vehicle delay as estimated by the CCG is obtained for a cycle length of 56 seconds. Our interest is to identify the cycle lengths providing the minimum emission and fuel consumption. From Figure 5.1, the minimum CO emission as estimated by the CCG occurs at a cycle length of 104 seconds and the minimum CO emission as estimated by the proposed model occurs at a cycle length of 122 seconds (actually CO continues to decrease as cycle length increases, but a cycle length of 122 seconds was the largest cycle examined in this comparison). From Figure 5.2 the minimum CCG HC emission occurs at a cycle length of 74 seconds and the minimum HC emission from the proposed model occurs at 122 seconds. Similarly from Figure 5.3, minimum CCG NOx emission and the proposed model occurs at a cycle length of 122 seconds. Figure 5.5 shows that minimum fuel consumption from CCG occurs at a cycle length of 74 seconds and the minimum fuel consumption from the proposed model occurs at a cycle length of 122 seconds. Hence it is shown that the cycle length that minimised delay does not also minimise emission and fuel consumption. This conclusion is true for both the CCG and the proposed emission and fuel models.

Table 5.1 – Minimum emission, fuel consumption, and delay as a function of cycle length

	Cycle Length (sec)	CCG Delay (sec/veh)	CCG (kg)	Regression (kg)
CO	56	19.945	5.28	2.714
	86	22.15	4.96	1.99
	122	26.835	5.076	1.46
HC	56	19.945	0.7	0.098
	74	20.901	0.669	0.082
	122	26.835	0.716	0.056
NOx	56	19.945	0.55	0.211
	122	26.835	0.498	0.129
Fuel	Cycle Length (sec)	CCG Delay (sec/veh)	CCG (Liters)	Regression (Liters)
	56	19.945	31.33	78.95
	74	20.901	30.72	68.98
	122	26.835	34.18	60.24

The results in Table 5.1 provide us with an opportunity to consider the trade off between vehicle delay and emissions for signal timing design. To further explore the trade-off between minimising emissions or delay, a comparison is made between the proportional change in delay, emission and fuel consumption at each of the identified cycle lengths. For example, if instead of minimising delay (C = 56 sec) we implement the cycle length that minimises CO emissions, then we expect to increase average vehicle delay, but decrease CO emissions. Using the CCG method, minimum CO emission occurs at a cycle length 86 seconds, hence if minimum emission is our criteria for determining a cycle length in a signal design than selection of a cycle length of 86 seconds will result in reducing emission at the signalised intersection by 6.06% [(5.28-4.96)/5.28], but an increase in delay of 11.04% will be experienced by the vehicles.

Similarly if we select a cycle length of 122 seconds which provides us with minimum CO emission as estimated by the proposed model, then the benefit is a 46.20% reduction in emission at the intersection but at a cost of a 34.54% increase in delay.

For hydrocarbons, the analysis is carried out for cycle lengths of 56 and 74 seconds for the CCG method. Selection of a cycle length of 74 seconds will result in reducing emission at the signalised intersection by 4.42%, but increasing delay by 4.79%. Similarly if we select a cycle length of 122 seconds, which provides the minimum HC emission from the proposed model, the benefit is a 42.85% reduction in hydrocarbon emission at the intersection but at a cost of a 34.54% increase in delay.

For nitrogen oxide, a cycle length of 122 seconds provides the minimum regression and CCG emission. Choosing a cycle length of 122 seconds will decrease CCG emission by 9.45% and regression NOx by 38.86% but at a cost of a 34.54% increase in delay.

The minimum fuel consumption as predicted by the CCG occurs at a cycle length 74 seconds. Selection of a cycle length of 74 seconds results in reducing fuel consumption at the signalised intersection by 1.94%, but increasing delay by 4.79%. Similarly if we select a cycle length of 122 seconds, which provides the minimum regression estimate of fuel consumption, the benefit is a 23.69% reduction in fuel consumption at the intersection but at a 34.54% increase in delay.

Table 5.2 summarises these results and also provides the ratio of the reduction in environmental measures to the increase in delay. For the proposed emission models this ratio is approximately 1.2 for CO, HC and NOx. This implies that for all 3 pollutants, increasing the cycle length from one that minimised delay (i.e. 56 seconds) to the cycle length that minimises emission (i.e. 122 seconds) results is a greater relative reduction in emission than the associated relative increase in delay.

Table 5.2 - Environmental and delay trade – offs

	CCG			Proposed		
	? D (%)	? E (%)	? E/ ? D	? D (%)	? E (%)	? E / ? D
CO	11.04	-6.06	0.55	34.54	-46.2	1.3
HC	4.79	-4.42	0.92	34.54	-42.85	1.2
NOx	34.54	-9.45	0.27	34.54	-38.86	1.1
Fuel	4.79	-1.94	0.4	34.54	-23.69	0.69

? D = Proportional increase in delay when implementing the cycle length that minimises environmental measure rather than the cycle length that minimises delay.

? E = Associated proportional decrease in environmental measure.

This trend is not observed for the CCG models as demonstrated by ratios < 1.0. For all CCG models, the results indicate smaller relative reduction in emissions than increases in delay.

Chapter 6

CONCLUSIONS AND RECOMMENDATIONS

A review of the literature indicates that while much research has been conducted to quantify vehicle tailpipe emissions, only one analytical model was found (the CCG model) that directly relates emission to traffic signal control parameters. Unfortunately, the derivation of the model has not been documented, with the result that the degree of accuracy of the model, and the level of confidence that can be placed in the model estimates, can not be established.

Microscopic traffic simulation models, such as INTEGRATION model, are robust tools for estimating the impact that changes in traffic control strategies have on vehicle emissions. Unfortunately, in many applications, the additional effort required to code the network, calibrate the model, and execute the model for each alternative control strategy, is not justified.

The comparison of the microscopic speed and acceleration behaviour of INTEGRATION to field data indicate that INTEGRATION overestimates the proportion of time vehicles spend at very low deceleration rates and underestimates more sever decelerations. The results also indicate that INTEGRATION tends to overestimate the proportion of time that vehicles spend at speeds greater than 32 km/h and underestimate the time associated with speeds less than 32 km/h. The overall ability of the INTEGRATION model to reflect field conditions is similar to that of the NETSIM traffic simulation model.

Unfortunately, it is not possible to make conclusions regarding the source or cause of these discrepancies. They may be a result of the modelling logic employed within NETSIM and within INTEGRATION. Conversely, they may result from inadequate specification of field conditions within the simulation models.

The proposed regression models for emission explain a large proportion of the observed variance within the emission data generated by the INTEGRATION model. A comparison of the proposed models for emission and fuel with those presented in the CCG revealed significant differences in emission and fuel estimates, especially at high degrees of saturation. The research results presented in this thesis cannot conclusively determine that the proposed models are superior to those by the CCG, however, the evidence seems to indicate that the estimates provided by the CCG models overestimate emissions by as much as a factor of 8.

The research also shows that the cycle length that provides minimum delay does not provide minimum emission and fuel consumption In all cases examined, reductions in emissions and fuel consumption were obtained by increasing the cycle length Application of the proposed models to a hypothetical intersection indicates that increasing the cycle length from the one minimises vehicle delay to one that minimises emissions, provides a greater proportional decrease in emissions than the corresponding proportional increase in delay.

It is recommended that the proposed models be expanded to explicitly include progression as an independent variable and the validity of the models for turning movements be established. It is also recommended that the models be used in a field application.

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Appendix A

A.1 Emission and fuel consumption data

Table A.1 describes emission and fuel consumption and various parameters used in 8100 scenarios simulated using INTEGRATION shown in Table A.2.

Table A.1 – Description of columns in Table A.2

	Name	Description

A	Seed #	Random number generator
B	S_f (km/hr)	Free flow speed, which exists when flows approach zero under free-flow conditions
C	S_c (km/hr)	Speed at capacity of approach link
D	C (sec)	Cycle-Length
E	g/C	Ratio of green interval to cycle length
F	X	Degree of saturation (ratio of arrival flow rate to capacity)
G	Trips Completed	Total number of completed vehicle trips
H	Average Fuel Consumption (Signal- Non signal case) (litres/veh)	Additional average fuel consumption that would be produced by each vehicle traversing a single approach as a result of the direct installation of a traffic signal.
I	HC (Signal- Non signal case) (gm/veh)	Additional average emission HC, that would be produced by each vehicle traversing a single approach as a result of the direct installation of a traffic signal.
J	CO (Signal- Non signal case) (gm/veh)	Additional average emission CO, that would be produced by each vehicle traversing a single approach as a result of the direct installation of a traffic signal.
K	NOx (Signal- Non signal case) (gm/veh)	Additional average emission NOx, that would be produced by each vehicle traversing a single approach as a result of the direct installation of a traffic signal.

Table A.2 – Emission and fuel consumption data derived from the Integration model output

A	B	C	D	E	F	G	H	I	J	K
1	80	75	60	0.3	0.4	216	0.038	2.490	13.901	0.112
1	80	75	60	0.3	0.6	324	0.038	1.631	9.602	0.134
1	80	75	60	0.3	0.8	432	0.054	1.489	9.021	0.184
1	80	75	60	0.3	0.9	486	0.074	1.373	8.629	0.226
1	80	75	60	0.3	0.95	513	0.140	1.349	8.333	0.257
1	80	75	60	0.3	0.97	524	0.102	1.476	8.165	0.157
1	80	75	60	0.3	0.99	535	0.164	1.407	8.558	0.267
1	80	75	60	0.3	1	540	0.162	1.375	8.417	0.258
1	80	75	60	0.3	1.01	545	0.173	1.520	9.179	0.271

A	B	C	D	E	F	G	H	I	J	K
1	80	75	60	0.5	0.4	360	0.027	1.281	7.611	0.093
1	80	75	60	0.5	0.6	540	0.025	0.988	5.888	0.098
1	80	75	60	0.5	0.8	720	0.035	0.819	5.134	0.145
1	80	75	60	0.5	0.9	810	0.055	0.928	5.865	0.184
1	80	75	60	0.5	0.95	855	0.091	0.924	5.717	0.210
1	80	75	60	0.5	0.97	873	0.100	1.008	6.239	0.210
1	80	75	60	0.5	0.99	891	0.117	0.893	5.336	0.205
1	80	75	60	0.5	1	900	0.125	1.005	6.113	0.218
1	80	75	60	0.5	1.01	909	0.128	0.914	5.486	0.210
1	80	75	60	0.7	0.4	504	0.016	0.589	3.600	0.062
1	80	75	60	0.7	0.6	756	0.017	0.702	4.271	0.077
1	80	75	60	0.7	0.8	1008	0.025	0.608	3.798	0.108
1	80	75	60	0.7	0.9	1134	0.039	0.540	3.506	0.133
1	80	75	60	0.7	0.95	1197	0.061	0.636	4.089	0.167
1	80	75	60	0.7	0.97	1222	0.067	0.596	3.646	0.154
1	80	75	60	0.7	0.99	1247	0.074	0.693	4.259	0.163
1	80	75	60	0.7	1	1260	0.072	0.628	3.822	0.160
1	80	75	60	0.7	1.01	1273	0.074	0.681	4.230	0.168
1	80	75	75	0.3	0.4	216	0.037	2.220	12.283	0.099
1	80	75	75	0.3	0.6	324	0.042	1.670	9.565	0.131
1	80	75	75	0.3	0.8	432	0.050	1.173	7.120	0.161
1	80	75	75	0.3	0.9	486	0.066	1.242	7.690	0.203
1	80	75	75	0.3	0.95	513	0.120	1.175	7.158	0.237
1	80	75	75	0.3	0.97	524	0.085	1.229	7.020	0.152
1	80	75	75	0.3	0.99	535	0.143	1.263	7.750	0.254
1	80	75	75	0.3	1	540	0.147	1.108	6.738	0.241
1	80	75	75	0.3	1.01	545	0.168	1.275	7.779	0.269
1	80	75	75	0.5	0.4	360	0.026	1.251	7.267	0.090
1	80	75	75	0.5	0.6	540	0.031	0.838	5.271	0.116
1	80	75	75	0.5	0.8	720	0.033	0.508	3.230	0.121
1	80	75	75	0.5	0.9	810	0.053	0.730	4.585	0.161
1	80	75	75	0.5	0.95	855	0.082	0.685	4.240	0.180
1	80	75	75	0.5	0.97	873	0.100	0.690	4.249	0.189
1	80	75	75	0.5	0.99	891	0.112	0.695	4.180	0.190
1	80	75	75	0.5	1	900	0.118	0.790	4.750	0.193
1	80	75	75	0.5	1.01	909	0.123	0.851	5.168	0.204
1	80	75	75	0.7	0.4	504	0.015	0.756	4.467	0.061
1	80	75	75	0.7	0.6	756	0.017	0.486	2.897	0.068
1	80	75	75	0.7	0.8	1008	0.023	0.470	3.022	0.101
1	80	75	75	0.7	0.9	1134	0.040	0.605	3.770	0.133
1	80	75	75	0.7	0.95	1197	0.062	0.521	3.226	0.140
1	80	75	75	0.7	0.97	1222	0.071	0.563	3.543	0.152
1	80	75	75	0.7	0.99	1247	0.073	0.567	3.549	0.153
1	80	75	75	0.7	1	1260	0.072	0.537	3.347	0.151
1	80	75	75	0.7	1.01	1273	0.073	0.559	3.415	0.152
1	80	75	90	0.3	0.4	216	0.041	2.225	12.261	0.107
1	80	75	90	0.3	0.6	324	0.044	1.462	8.441	0.131
1	80	75	90	0.3	0.8	432	0.049	0.960	5.971	0.152
1	80	75	90	0.3	0.9	486	0.070	1.101	6.698	0.194
1	80	75	90	0.3	0.95	513	0.125	1.136	6.885	0.234
1	80	75	90	0.3	0.97	524	0.085	1.122	6.372	0.150
1	80	75	90	0.3	0.99	535	0.139	1.062	6.602	0.249
1	80	75	90	0.3	1	540	0.157	1.106	6.744	0.250
1	80	75	90	0.3	1.01	545	0.169	1.147	6.764	0.248
1	80	75	90	0.5	0.4	360	0.027	1.122	6.444	0.087
1	80	75	90	0.5	0.6	540	0.031	0.817	4.890	0.105
1	80	75	90	0.5	0.8	720	0.037	0.563	3.600	0.132
1	80	75	90	0.5	0.9	810	0.049	0.613	3.920	0.144
1	80	75	90	0.5	0.95	855	0.083	0.621	3.969	0.179
1	80	75	90	0.5	0.97	873	0.107	0.651	3.967	0.178
1	80	75	90	0.5	0.99	891	0.111	0.608	3.632	0.174
1	80	75	90	0.5	1	900	0.118	0.700	4.288	0.193
1	80	75	90	0.5	1.01	909	0.126	0.668	3.998	0.182
1	80	75	90	0.7	0.4	504	0.016	0.756	4.438	0.061
1	80	75	90	0.7	0.6	756	0.015	0.316	2.037	0.061
1	80	75	90	0.7	0.8	1008	0.024	0.403	2.548	0.093
1	80	75	90	0.7	0.9	1134	0.039	0.381	2.436	0.111
1	80	75	90	0.7	0.95	1197	0.057	0.481	3.109	0.147

A	B	C	D	E	F	G	H	I	J	K
1	80	75	90	0.7	0.97	1222	0.071	0.468	2.913	0.141
1	80	75	90	0.7	0.99	1247	0.072	0.436	2.728	0.138
1	80	75	90	0.7	1	1260	0.071	0.471	2.943	0.143
1	80	75	90	0.7	1.01	1273	0.072	0.408	2.553	0.140
1	80	75	105	0.3	0.4	216	0.041	1.836	10.254	0.108
1	80	75	105	0.3	0.6	324	0.043	1.363	7.887	0.125
1	80	75	105	0.3	0.8	432	0.055	0.975	5.943	0.162
1	80	75	105	0.3	0.9	486	0.067	0.999	6.050	0.184
1	80	75	105	0.3	0.95	513	0.115	0.959	5.880	0.218
1	80	75	105	0.3	0.97	524	0.077	0.787	4.485	0.132
1	80	75	105	0.3	0.99	535	0.146	0.979	5.900	0.233
1	80	75	105	0.3	1	540	0.150	0.934	5.750	0.234
1	80	75	105	0.3	1.01	545	0.162	1.009	6.156	0.248
1	80	75	105	0.5	0.4	360	0.027	0.941	5.595	0.090
1	80	75	105	0.5	0.6	540	0.030	0.679	4.129	0.101
1	80	75	105	0.5	0.8	720	0.034	0.456	2.986	0.116
1	80	75	105	0.5	0.9	810	0.054	0.487	3.105	0.135
1	80	75	105	0.5	0.95	855	0.084	0.631	3.797	0.160
1	80	75	105	0.5	0.97	873	0.102	0.612	3.744	0.172
1	80	75	105	0.5	0.99	891	0.114	0.639	3.989	0.181
1	80	75	105	0.5	1	900	0.124	0.659	3.901	0.175
1	80	75	105	0.5	1.01	909	0.125	0.570	3.478	0.177
1	80	75	105	0.7	0.4	504	0.016	0.650	3.890	0.066
1	80	75	105	0.7	0.6	756	0.017	0.350	2.220	0.069
1	80	75	105	0.7	0.8	1008	0.026	0.358	2.282	0.087
1	80	75	105	0.7	0.9	1134	0.040	0.352	2.372	0.118
1	80	75	105	0.7	0.95	1197	0.059	0.371	2.441	0.135
1	80	75	105	0.7	0.97	1222	0.072	0.408	2.512	0.131
1	80	75	105	0.7	0.99	1247	0.072	0.365	2.297	0.129
1	80	75	105	0.7	1	1260	0.070	0.384	2.462	0.139
1	80	75	105	0.7	1.01	1273	0.073	0.390	2.489	0.138
1	80	75	120	0.3	0.4	216	0.045	1.540	8.921	0.121
1	80	75	120	0.3	0.6	324	0.045	0.970	5.831	0.129
1	80	75	120	0.3	0.8	432	0.053	0.833	5.153	0.143
1	80	75	120	0.3	0.9	486	0.064	0.663	4.175	0.165
1	80	75	120	0.3	0.95	513	0.120	0.948	5.767	0.213
1	80	75	120	0.3	0.97	524	0.087	0.831	4.660	0.138
1	80	75	120	0.3	0.99	535	0.140	0.888	5.220	0.217
1	80	75	120	0.3	1	540	0.144	0.932	5.708	0.226
1	80	75	120	0.3	1.01	545	0.164	0.871	5.177	0.225
1	80	75	120	0.5	0.4	360	0.030	1.023	6.115	0.099
1	80	75	120	0.5	0.6	540	0.031	0.436	2.679	0.087
1	80	75	120	0.5	0.8	720	0.034	0.416	2.577	0.098
1	80	75	120	0.5	0.9	810	0.055	0.414	2.655	0.127
1	80	75	120	0.5	0.95	855	0.085	0.517	3.131	0.154
1	80	75	120	0.5	0.97	873	0.100	0.432	2.826	0.169
1	80	75	120	0.5	0.99	891	0.115	0.561	3.415	0.164
1	80	75	120	0.5	1	900	0.118	0.509	3.155	0.175
1	80	75	120	0.5	1.01	909	0.128	0.574	3.401	0.169
1	80	75	120	0.7	0.4	504	0.013	0.399	2.436	0.046
1	80	75	120	0.7	0.6	756	0.018	0.357	2.202	0.069
1	80	75	120	0.7	0.8	1008	0.022	0.243	1.584	0.075
1	80	75	120	0.7	0.9	1134	0.036	0.302	1.946	0.095
1	80	75	120	0.7	0.95	1197	0.059	0.290	1.891	0.120
1	80	75	120	0.7	0.97	1222	0.071	0.394	2.458	0.128
1	80	75	120	0.7	0.99	1247	0.070	0.344	2.120	0.120
1	80	75	120	0.7	1	1260	0.071	0.409	2.553	0.133
1	80	75	120	0.7	1.01	1273	0.070	0.321	2.027	0.126
1	80	70	60	0.3	0.4	216	0.039	2.632	14.532	0.118
1	80	70	60	0.3	0.6	324	0.039	1.718	9.924	0.135
1	80	70	60	0.3	0.8	432	0.053	1.418	8.543	0.177
1	80	70	60	0.3	0.9	486	0.069	1.387	8.408	0.208
1	80	70	60	0.3	0.95	513	0.120	1.567	9.332	0.247
1	80	70	60	0.3	0.97	524	0.169	1.376	8.797	0.337
1	80	70	60	0.3	0.99	535	0.132	1.577	9.323	0.250
1	80	70	60	0.3	1	540	0.134	1.576	9.403	0.253
1	80	70	60	0.3	1.01	545	0.138	1.330	7.942	0.247
1	80	70	60	0.5	0.4	360	0.029	1.570	8.939	0.102

A	B	C	D	E	F	G	H	I	J	K
1	80	70	60	0.5	0.6	540	0.029	0.955	5.731	0.105
1	80	70	60	0.5	0.8	720	0.036	0.820	5.092	0.134
1	80	70	60	0.5	0.9	810	0.049	0.841	5.310	0.171
1	80	70	60	0.5	0.95	855	0.069	0.773	4.848	0.191
1	80	70	60	0.5	0.97	873	0.083	0.862	5.348	0.197
1	80	70	60	0.5	0.99	891	0.085	0.856	5.227	0.195
1	80	70	60	0.5	1	900	0.085	0.872	5.278	0.195
1	80	70	60	0.5	1.01	909	0.087	0.786	4.771	0.194
1	80	70	60	0.7	0.4	504	0.017	0.868	5.132	0.063
1	80	70	60	0.7	0.6	756	0.018	0.549	3.441	0.075
1	80	70	60	0.7	0.8	1008	0.025	0.527	3.373	0.104
1	80	70	60	0.7	0.9	1134	0.036	0.556	3.587	0.130
1	80	70	60	0.7	0.95	1197	0.046	0.576	3.697	0.151
1	80	70	60	0.7	0.97	1222	0.052	0.555	3.526	0.157
1	80	70	60	0.7	0.99	1247	0.052	0.485	3.086	0.151
1	80	70	60	0.7	1	1260	0.052	0.543	3.446	0.157
1	80	70	60	0.7	1.01	1273	0.054	0.478	3.112	0.160
1	80	70	75	0.3	0.4	216	0.042	2.377	13.372	0.130
1	80	70	75	0.3	0.6	324	0.039	1.524	8.768	0.133
1	80	70	75	0.3	0.8	432	0.051	1.276	7.727	0.169
1	80	70	75	0.3	0.9	486	0.070	1.349	8.129	0.208
1	80	70	75	0.3	0.95	513	0.113	1.332	7.991	0.241
1	80	70	75	0.3	0.97	524	0.172	1.174	7.723	0.329
1	80	70	75	0.3	0.99	535	0.125	1.278	7.680	0.241
1	80	70	75	0.3	1	540	0.131	1.317	7.846	0.248
1	80	70	75	0.3	1.01	545	0.136	1.319	7.834	0.242
1	80	70	75	0.5	0.4	360	0.027	1.359	7.821	0.093
1	80	70	75	0.5	0.6	540	0.029	0.973	5.828	0.104
1	80	70	75	0.5	0.8	720	0.034	0.711	4.392	0.125
1	80	70	75	0.5	0.9	810	0.048	0.640	4.066	0.149
1	80	70	75	0.5	0.95	855	0.073	0.859	5.229	0.184
1	80	70	75	0.5	0.97	873	0.083	0.839	4.949	0.177
1	80	70	75	0.5	0.99	891	0.082	0.667	4.011	0.171
1	80	70	75	0.5	1	900	0.083	0.724	4.322	0.180
1	80	70	75	0.5	1.01	909	0.085	0.649	3.920	0.175
1	80	70	75	0.7	0.4	504	0.015	0.702	4.101	0.058
1	80	70	75	0.7	0.6	756	0.017	0.551	3.391	0.071
1	80	70	75	0.7	0.8	1008	0.022	0.443	2.766	0.086
1	80	70	75	0.7	0.9	1134	0.033	0.407	2.738	0.111
1	80	70	75	0.7	0.95	1197	0.044	0.423	2.757	0.133
1	80	70	75	0.7	0.97	1222	0.049	0.409	2.588	0.137
1	80	70	75	0.7	0.99	1247	0.050	0.429	2.714	0.133
1	80	70	75	0.7	1	1260	0.051	0.402	2.599	0.142
1	80	70	75	0.7	1.01	1273	0.051	0.434	2.763	0.137
1	80	70	90	0.3	0.4	216	0.043	2.044	11.851	0.138
1	80	70	90	0.3	0.6	324	0.044	1.325	7.946	0.146
1	80	70	90	0.3	0.8	432	0.053	1.109	6.806	0.169
1	80	70	90	0.3	0.9	486	0.066	1.123	6.877	0.191
1	80	70	90	0.3	0.95	513	0.113	1.175	6.984	0.229
1	80	70	90	0.3	0.97	524	0.163	1.046	6.869	0.319
1	80	70	90	0.3	0.99	535	0.125	1.110	6.609	0.228
1	80	70	90	0.3	1	540	0.129	0.911	5.589	0.229
1	80	70	90	0.3	1.01	545	0.132	1.189	7.007	0.233
1	80	70	90	0.5	0.4	360	0.028	1.235	7.056	0.094
1	80	70	90	0.5	0.6	540	0.029	0.818	4.894	0.098
1	80	70	90	0.5	0.8	720	0.035	0.544	3.400	0.113
1	80	70	90	0.5	0.9	810	0.050	0.562	3.541	0.137
1	80	70	90	0.5	0.95	855	0.066	0.607	3.780	0.157
1	80	70	90	0.5	0.97	873	0.079	0.619	3.753	0.162
1	80	70	90	0.5	0.99	891	0.080	0.558	3.284	0.154
1	80	70	90	0.5	1	900	0.079	0.622	3.629	0.156
1	80	70	90	0.5	1.01	909	0.083	0.617	3.684	0.161
1	80	70	90	0.7	0.4	504	0.015	0.709	4.054	0.057
1	80	70	90	0.7	0.6	756	0.020	0.512	3.119	0.075
1	80	70	90	0.7	0.8	1008	0.022	0.418	2.611	0.079
1	80	70	90	0.7	0.9	1134	0.033	0.301	1.945	0.100
1	80	70	90	0.7	0.95	1197	0.041	0.348	2.251	0.111
1	80	70	90	0.7	0.97	1222	0.047	0.381	2.418	0.124

A	B	C	D	E	F	G	H	I	J	K
1	80	70	90	0.7	0.99	1247	0.048	0.358	2.227	0.119
1	80	70	90	0.7	1	1260	0.047	0.322	2.016	0.118
1	80	70	90	0.7	1.01	1273	0.048	0.352	2.181	0.118
1	80	70	105	0.3	0.4	216	0.043	1.673	9.753	0.136
1	80	70	105	0.3	0.6	324	0.040	1.096	6.424	0.124
1	80	70	105	0.3	0.8	432	0.048	1.023	6.104	0.143
1	80	70	105	0.3	0.9	486	0.067	0.963	5.859	0.180
1	80	70	105	0.3	0.95	513	0.112	0.856	5.203	0.206
1	80	70	105	0.3	0.97	524	0.163	0.881	5.956	0.309
1	80	70	105	0.3	0.99	535	0.121	0.850	5.181	0.213
1	80	70	105	0.3	1	540	0.127	0.929	5.656	0.227
1	80	70	105	0.3	1.01	545	0.132	0.982	5.920	0.225
1	80	70	105	0.5	0.4	360	0.029	0.979	5.779	0.094
1	80	70	105	0.5	0.6	540	0.030	0.602	3.688	0.096
1	80	70	105	0.5	0.8	720	0.035	0.470	2.935	0.107
1	80	70	105	0.5	0.9	810	0.051	0.506	3.146	0.130
1	80	70	105	0.5	0.95	855	0.070	0.494	3.180	0.153
1	80	70	105	0.5	0.97	873	0.076	0.468	2.773	0.140
1	80	70	105	0.5	0.99	891	0.077	0.476	2.847	0.141
1	80	70	105	0.5	1	900	0.079	0.487	2.888	0.150
1	80	70	105	0.5	1.01	909	0.080	0.517	3.117	0.146
1	80	70	105	0.7	0.4	504	0.018	0.642	3.894	0.071
1	80	70	105	0.7	0.6	756	0.017	0.507	3.090	0.066
1	80	70	105	0.7	0.8	1008	0.022	0.407	2.461	0.075
1	80	70	105	0.7	0.9	1134	0.034	0.357	2.270	0.095
1	80	70	105	0.7	0.95	1197	0.042	0.377	2.369	0.104
1	80	70	105	0.7	0.97	1222	0.045	0.288	1.855	0.108
1	80	70	105	0.7	0.99	1247	0.045	0.359	2.211	0.109
1	80	70	105	0.7	1	1260	0.045	0.371	2.265	0.107
1	80	70	105	0.7	1.01	1273	0.045	0.300	1.896	0.104
1	80	70	120	0.3	0.4	216	0.046	1.578	9.415	0.147
1	80	70	120	0.3	0.6	324	0.045	0.956	5.846	0.132
1	80	70	120	0.3	0.8	432	0.054	0.907	5.566	0.155
1	80	70	120	0.3	0.9	486	0.059	0.805	4.903	0.156
1	80	70	120	0.3	0.95	513	0.111	0.730	4.483	0.193
1	80	70	120	0.3	0.97	524	0.167	1.028	6.762	0.315
1	80	70	120	0.3	0.99	535	0.124	0.759	4.689	0.213
1	80	70	120	0.3	1	540	0.127	0.852	5.152	0.204
1	80	70	120	0.3	1.01	545	0.136	0.740	4.448	0.203
1	80	70	120	0.5	0.4	360	0.030	0.909	5.376	0.099
1	80	70	120	0.5	0.6	540	0.029	0.672	4.083	0.092
1	80	70	120	0.5	0.8	720	0.036	0.441	2.782	0.100
1	80	70	120	0.5	0.9	810	0.051	0.448	2.890	0.129
1	80	70	120	0.5	0.95	855	0.069	0.354	2.314	0.132
1	80	70	120	0.5	0.97	873	0.071	0.421	2.543	0.124
1	80	70	120	0.5	0.99	891	0.076	0.508	3.060	0.140
1	80	70	120	0.5	1	900	0.074	0.438	2.581	0.126
1	80	70	120	0.5	1.01	909	0.076	0.389	2.315	0.129
1	80	70	120	0.7	0.4	504	0.016	0.561	3.278	0.060
1	80	70	120	0.7	0.6	756	0.016	0.322	2.013	0.060
1	80	70	120	0.7	0.8	1008	0.023	0.366	2.269	0.075
1	80	70	120	0.7	0.9	1134	0.032	0.222	1.370	0.075
1	80	70	120	0.7	0.95	1197	0.040	0.315	1.969	0.098
1	80	70	120	0.7	0.97	1222	0.043	0.344	2.086	0.098
1	80	70	120	0.7	0.99	1247	0.043	0.277	1.663	0.087
1	80	70	120	0.7	1	1260	0.043	0.293	1.789	0.096
1	80	70	120	0.7	1.01	1273	0.044	0.329	2.062	0.103
1	80	60	60	0.3	0.4	216	0.037	1.934	11.031	0.121
1	80	60	60	0.3	0.6	324	0.036	1.378	8.101	0.129
1	80	60	60	0.3	0.8	432	0.047	1.146	6.831	0.162
1	80	60	60	0.3	0.9	486	0.056	1.001	6.140	0.182
1	80	60	60	0.3	0.95	513	0.101	1.076	6.548	0.228
1	80	60	60	0.3	0.97	524	0.105	1.122	6.714	0.223
1	80	60	60	0.3	0.99	535	0.121	1.166	6.989	0.240
1	80	60	60	0.3	1	540	0.118	1.099	6.711	0.233
1	80	60	60	0.3	1.01	545	0.133	1.152	7.025	0.246
1	80	60	60	0.5	0.4	360	0.026	1.056	6.365	0.094
1	80	60	60	0.5	0.6	540	0.024	0.737	4.464	0.096

A	B	C	D	E	F	G	H	I	J	K
1	80	60	60	0.5	0.8	720	0.030	0.520	3.384	0.119
1	80	60	60	0.5	0.9	810	0.040	0.505	3.343	0.140
1	80	60	60	0.5	0.95	855	0.059	0.610	3.931	0.167
1	80	60	60	0.5	0.97	873	0.059	0.657	4.016	0.154
1	80	60	60	0.5	0.99	891	0.076	0.605	3.860	0.183
1	80	60	60	0.5	1	900	0.090	0.663	4.049	0.174
1	80	60	60	0.5	1.01	909	0.098	0.590	3.685	0.174
1	80	60	60	0.7	0.4	504	0.014	0.508	3.128	0.061
1	80	60	60	0.7	0.6	756	0.016	0.494	3.112	0.076
1	80	60	60	0.7	0.8	1008	0.021	0.370	2.397	0.086
1	80	60	60	0.7	0.9	1134	0.029	0.362	2.373	0.099
1	80	60	60	0.7	0.95	1197	0.034	0.354	2.316	0.110
1	80	60	60	0.7	0.97	1222	0.042	0.351	2.301	0.119
1	80	60	60	0.7	0.99	1247	0.055	0.440	2.739	0.131
1	80	60	60	0.7	1	1260	0.065	0.360	2.276	0.125
1	80	60	60	0.7	1.01	1273	0.072	0.434	2.441	0.124
1	80	60	75	0.3	0.4	216	0.036	1.653	9.639	0.114
1	80	60	75	0.3	0.6	324	0.038	1.309	7.653	0.125
1	80	60	75	0.3	0.8	432	0.045	0.920	5.529	0.147
1	80	60	75	0.3	0.9	486	0.056	1.165	6.954	0.172
1	80	60	75	0.3	0.95	513	0.085	0.912	5.556	0.205
1	80	60	75	0.3	0.97	524	0.104	0.951	5.798	0.216
1	80	60	75	0.3	0.99	535	0.111	0.879	5.441	0.223
1	80	60	75	0.3	1	540	0.115	0.895	5.435	0.214
1	80	60	75	0.3	1.01	545	0.133	1.006	6.227	0.240
1	80	60	75	0.5	0.4	360	0.025	0.906	5.513	0.092
1	80	60	75	0.5	0.6	540	0.028	0.633	3.989	0.106
1	80	60	75	0.5	0.8	720	0.030	0.409	2.582	0.102
1	80	60	75	0.5	0.9	810	0.037	0.551	3.403	0.125
1	80	60	75	0.5	0.95	855	0.052	0.561	3.377	0.133
1	80	60	75	0.5	0.97	873	0.061	0.510	3.090	0.141
1	80	60	75	0.5	0.99	891	0.074	0.532	3.264	0.156
1	80	60	75	0.5	1	900	0.084	0.534	3.307	0.155
1	80	60	75	0.5	1.01	909	0.105	0.568	3.445	0.162
1	80	60	75	0.7	0.4	504	0.014	0.584	3.492	0.058
1	80	60	75	0.7	0.6	756	0.015	0.388	2.360	0.063
1	80	60	75	0.7	0.8	1008	0.020	0.275	1.850	0.081
1	80	60	75	0.7	0.9	1134	0.029	0.328	2.102	0.094
1	80	60	75	0.7	0.95	1197	0.036	0.314	2.043	0.102
1	80	60	75	0.7	0.97	1222	0.042	0.297	1.942	0.108
1	80	60	75	0.7	0.99	1247	0.055	0.361	2.232	0.119
1	80	60	75	0.7	1	1260	0.068	0.354	1.989	0.109
1	80	60	75	0.7	1.01	1273	0.072	0.339	1.784	0.112
1	80	60	90	0.3	0.4	216	0.039	1.675	9.564	0.117
1	80	60	90	0.3	0.6	324	0.040	1.049	6.253	0.126
1	80	60	90	0.3	0.8	432	0.043	0.674	4.216	0.133
1	80	60	90	0.3	0.9	486	0.055	0.721	4.549	0.161
1	80	60	90	0.3	0.95	513	0.085	0.834	4.983	0.184
1	80	60	90	0.3	0.97	524	0.101	0.808	4.830	0.195
1	80	60	90	0.3	0.99	535	0.107	0.896	5.342	0.202
1	80	60	90	0.3	1	540	0.115	0.848	5.283	0.217
1	80	60	90	0.3	1.01	545	0.122	0.895	5.353	0.209
1	80	60	90	0.5	0.4	360	0.025	0.900	5.169	0.085
1	80	60	90	0.5	0.6	540	0.028	0.594	3.584	0.097
1	80	60	90	0.5	0.8	720	0.033	0.384	2.493	0.105
1	80	60	90	0.5	0.9	810	0.035	0.403	2.538	0.103
1	80	60	90	0.5	0.95	855	0.050	0.390	2.445	0.118
1	80	60	90	0.5	0.97	873	0.066	0.471	2.864	0.131
1	80	60	90	0.5	0.99	891	0.071	0.438	2.717	0.141
1	80	60	90	0.5	1	900	0.090	0.486	2.988	0.151
1	80	60	90	0.5	1.01	909	0.095	0.471	2.911	0.151
1	80	60	90	0.7	0.4	504	0.015	0.564	3.361	0.061
1	80	60	90	0.7	0.6	756	0.014	0.251	1.624	0.057
1	80	60	90	0.7	0.8	1008	0.020	0.252	1.656	0.071
1	80	60	90	0.7	0.9	1134	0.030	0.232	1.575	0.084
1	80	60	90	0.7	0.95	1197	0.036	0.278	1.782	0.090
1	80	60	90	0.7	0.97	1222	0.045	0.293	1.844	0.097
1	80	60	90	0.7	0.99	1247	0.053	0.285	1.790	0.106

A	B	C	D	E	F	G	H	I	J	K
1	80	60	90	0.7	1	1260	0.065	0.301	1.671	0.093
1	80	60	90	0.7	1.01	1273	0.071	0.279	1.414	0.101
1	80	60	105	0.3	0.4	216	0.040	1.394	8.086	0.119
1	80	60	105	0.3	0.6	324	0.040	1.026	6.077	0.122
1	80	60	105	0.3	0.8	432	0.048	0.651	4.088	0.137
1	80	60	105	0.3	0.9	486	0.054	0.562	3.522	0.141
1	80	60	105	0.3	0.95	513	0.082	0.634	3.986	0.178
1	80	60	105	0.3	0.97	524	0.097	0.559	3.482	0.178
1	80	60	105	0.3	0.99	535	0.110	0.730	4.385	0.187
1	80	60	105	0.3	1	540	0.105	0.766	4.734	0.194
1	80	60	105	0.3	1.01	545	0.128	0.759	4.702	0.202
1	80	60	105	0.5	0.4	360	0.026	0.660	4.041	0.089
1	80	60	105	0.5	0.6	540	0.028	0.476	2.946	0.091
1	80	60	105	0.5	0.8	720	0.030	0.356	2.283	0.097
1	80	60	105	0.5	0.9	810	0.040	0.369	2.324	0.103
1	80	60	105	0.5	0.95	855	0.053	0.429	2.626	0.114
1	80	60	105	0.5	0.97	873	0.058	0.331	2.149	0.120
1	80	60	105	0.5	0.99	891	0.077	0.416	2.538	0.130
1	80	60	105	0.5	1	900	0.094	0.367	2.334	0.139
1	80	60	105	0.5	1.01	909	0.104	0.393	2.433	0.139
1	80	60	105	0.7	0.4	504	0.015	0.490	2.948	0.063
1	80	60	105	0.7	0.6	756	0.016	0.250	1.599	0.062
1	80	60	105	0.7	0.8	1008	0.021	0.179	1.228	0.066
1	80	60	105	0.7	0.9	1134	0.029	0.248	1.584	0.078
1	80	60	105	0.7	0.95	1197	0.037	0.248	1.585	0.084
1	80	60	105	0.7	0.97	1222	0.046	0.257	1.645	0.096
1	80	60	105	0.7	0.99	1247	0.057	0.252	1.489	0.092
1	80	60	105	0.7	1	1260	0.067	0.273	1.425	0.092
1	80	60	105	0.7	1.01	1273	0.069	0.221	1.041	0.085
1	80	60	120	0.3	0.4	216	0.043	1.149	6.927	0.126
1	80	60	120	0.3	0.6	324	0.042	0.734	4.499	0.124
1	80	60	120	0.3	0.8	432	0.048	0.591	3.712	0.130
1	80	60	120	0.3	0.9	486	0.054	0.450	2.840	0.130
1	80	60	120	0.3	0.95	513	0.089	0.575	3.517	0.158
1	80	60	120	0.3	0.97	524	0.105	0.630	3.918	0.176
1	80	60	120	0.3	0.99	535	0.108	0.602	3.720	0.183
1	80	60	120	0.3	1	540	0.112	0.666	3.983	0.171
1	80	60	120	0.3	1.01	545	0.126	0.659	3.997	0.185
1	80	60	120	0.5	0.4	360	0.029	0.715	4.371	0.098
1	80	60	120	0.5	0.6	540	0.028	0.328	2.048	0.079
1	80	60	120	0.5	0.8	720	0.030	0.311	1.896	0.079
1	80	60	120	0.5	0.9	810	0.043	0.334	2.112	0.101
1	80	60	120	0.5	0.95	855	0.052	0.274	1.696	0.098
1	80	60	120	0.5	0.97	873	0.063	0.383	2.342	0.108
1	80	60	120	0.5	0.99	891	0.080	0.454	2.748	0.125
1	80	60	120	0.5	1	900	0.085	0.382	2.276	0.117
1	80	60	120	0.5	1.01	909	0.106	0.369	2.201	0.131
1	80	60	120	0.7	0.4	504	0.011	0.323	1.940	0.042
1	80	60	120	0.7	0.6	756	0.016	0.257	1.585	0.058
1	80	60	120	0.7	0.8	1008	0.019	0.174	1.132	0.058
1	80	60	120	0.7	0.9	1134	0.027	0.224	1.402	0.066
1	80	60	120	0.7	0.95	1197	0.038	0.221	1.401	0.081
1	80	60	120	0.7	0.97	1222	0.041	0.219	1.371	0.081
1	80	60	120	0.7	0.99	1247	0.057	0.224	1.273	0.079
1	80	60	120	0.7	1	1260	0.065	0.215	1.049	0.081
1	80	60	120	0.7	1.01	1273	0.068	0.245	1.160	0.083
1	70	65	60	0.3	0.4	216	0.030	1.181	6.616	0.105
1	70	65	60	0.3	0.6	324	0.032	0.802	4.624	0.113
1	70	65	60	0.3	0.8	432	0.045	0.651	3.973	0.149
1	70	65	60	0.3	0.9	486	0.070	0.679	4.299	0.196
1	70	65	60	0.3	0.95	513	0.128	0.712	4.375	0.232
1	70	65	60	0.3	0.97	524	0.132	0.796	4.809	0.235
1	70	65	60	0.3	0.99	535	0.152	0.762	4.629	0.247
1	70	65	60	0.3	1	540	0.152	0.812	4.943	0.248
1	70	65	60	0.3	1.01	545	0.160	0.747	4.526	0.243
1	70	65	60	0.5	0.4	360	0.019	0.524	3.076	0.075
1	70	65	60	0.5	0.6	540	0.022	0.480	2.898	0.089
1	70	65	60	0.5	0.8	720	0.029	0.325	2.169	0.113

A	B	C	D	E	F	G	H	I	J	K
1	70	65	60	0.5	0.9	810	0.047	0.355	2.371	0.143
1	70	65	60	0.5	0.95	855	0.079	0.429	2.741	0.174
1	70	65	60	0.5	0.97	873	0.099	0.451	2.734	0.173
1	70	65	60	0.5	0.99	891	0.117	0.459	2.782	0.179
1	70	65	60	0.5	1	900	0.119	0.435	2.610	0.178
1	70	65	60	0.5	1.01	909	0.126	0.494	2.857	0.178
1	70	65	60	0.7	0.4	504	0.011	0.300	1.791	0.049
1	70	65	60	0.7	0.6	756	0.013	0.229	1.496	0.062
1	70	65	60	0.7	0.8	1008	0.020	0.271	1.781	0.089
1	70	65	60	0.7	0.9	1134	0.034	0.257	1.722	0.107
1	70	65	60	0.7	0.95	1197	0.055	0.290	1.888	0.131
1	70	65	60	0.7	0.97	1222	0.067	0.314	1.948	0.130
1	70	65	60	0.7	0.99	1247	0.067	0.273	1.668	0.121
1	70	65	60	0.7	1	1260	0.069	0.326	2.013	0.134
1	70	65	60	0.7	1.01	1273	0.069	0.297	1.900	0.134
1	70	65	75	0.3	0.4	216	0.033	1.010	5.762	0.110
1	70	65	75	0.3	0.6	324	0.034	0.615	3.820	0.120
1	70	65	75	0.3	0.8	432	0.043	0.528	3.275	0.132
1	70	65	75	0.3	0.9	486	0.059	0.497	3.296	0.169
1	70	65	75	0.3	0.95	513	0.119	0.676	4.112	0.220
1	70	65	75	0.3	0.97	524	0.118	0.528	3.369	0.206
1	70	65	75	0.3	0.99	535	0.131	0.521	3.326	0.214
1	70	65	75	0.3	1	540	0.143	0.711	4.218	0.224
1	70	65	75	0.3	1.01	545	0.156	0.597	3.679	0.230
1	70	65	75	0.5	0.4	360	0.023	0.542	3.173	0.084
1	70	65	75	0.5	0.6	540	0.023	0.261	1.762	0.086
1	70	65	75	0.5	0.8	720	0.029	0.293	1.886	0.097
1	70	65	75	0.5	0.9	810	0.049	0.346	2.260	0.135
1	70	65	75	0.5	0.95	855	0.078	0.424	2.655	0.158
1	70	65	75	0.5	0.97	873	0.092	0.370	2.258	0.153
1	70	65	75	0.5	0.99	891	0.110	0.380	2.234	0.156
1	70	65	75	0.5	1	900	0.116	0.432	2.583	0.171
1	70	65	75	0.5	1.01	909	0.117	0.399	2.272	0.152
1	70	65	75	0.7	0.4	504	0.014	0.327	2.022	0.060
1	70	65	75	0.7	0.6	756	0.013	0.188	1.263	0.059
1	70	65	75	0.7	0.8	1008	0.021	0.186	1.268	0.076
1	70	65	75	0.7	0.9	1134	0.038	0.230	1.506	0.100
1	70	65	75	0.7	0.95	1197	0.060	0.204	1.341	0.116
1	70	65	75	0.7	0.97	1222	0.066	0.240	1.533	0.118
1	70	65	75	0.7	0.99	1247	0.068	0.242	1.551	0.119
1	70	65	75	0.7	1	1260	0.067	0.239	1.538	0.122
1	70	65	75	0.7	1.01	1273	0.067	0.251	1.624	0.122
1	70	65	90	0.3	0.4	216	0.035	0.898	5.260	0.111
1	70	65	90	0.3	0.6	324	0.034	0.572	3.414	0.106
1	70	65	90	0.3	0.8	432	0.043	0.446	2.844	0.130
1	70	65	90	0.3	0.9	486	0.058	0.442	2.865	0.157
1	70	65	90	0.3	0.95	513	0.111	0.487	3.071	0.200
1	70	65	90	0.3	0.97	524	0.122	0.550	3.406	0.208
1	70	65	90	0.3	0.99	535	0.132	0.504	3.124	0.210
1	70	65	90	0.3	1	540	0.145	0.578	3.452	0.213
1	70	65	90	0.3	1.01	545	0.149	0.540	3.337	0.219
1	70	65	90	0.5	0.4	360	0.022	0.506	2.925	0.076
1	70	65	90	0.5	0.6	540	0.025	0.292	1.886	0.088
1	70	65	90	0.5	0.8	720	0.031	0.202	1.410	0.095
1	70	65	90	0.5	0.9	810	0.046	0.302	1.926	0.117
1	70	65	90	0.5	0.95	855	0.087	0.330	1.981	0.139
1	70	65	90	0.5	0.97	873	0.101	0.336	2.027	0.145
1	70	65	90	0.5	0.99	891	0.112	0.325	1.935	0.147
1	70	65	90	0.5	1	900	0.117	0.359	2.120	0.156
1	70	65	90	0.5	1.01	909	0.118	0.328	1.921	0.147
1	70	65	90	0.7	0.4	504	0.014	0.327	2.005	0.060
1	70	65	90	0.7	0.6	756	0.011	0.182	1.133	0.046
1	70	65	90	0.7	0.8	1008	0.021	0.179	1.234	0.076
1	70	65	90	0.7	0.9	1134	0.036	0.183	1.226	0.087
1	70	65	90	0.7	0.95	1197	0.062	0.173	1.110	0.105
1	70	65	90	0.7	0.97	1222	0.064	0.188	1.180	0.105
1	70	65	90	0.7	0.99	1247	0.066	0.215	1.281	0.101
1	70	65	90	0.7	1	1260	0.066	0.213	1.334	0.114

A	B	C	D	E	F	G	H	I	J	K
1	70	65	90	0.7	1.01	1273	0.067	0.222	1.314	0.102
1	70	65	105	0.3	0.4	216	0.039	0.775	4.697	0.119
1	70	65	105	0.3	0.6	324	0.038	0.548	3.350	0.111
1	70	65	105	0.3	0.8	432	0.047	0.385	2.521	0.128
1	70	65	105	0.3	0.9	486	0.066	0.399	2.604	0.153
1	70	65	105	0.3	0.95	513	0.107	0.440	2.808	0.186
1	70	65	105	0.3	0.97	524	0.127	0.505	3.112	0.201
1	70	65	105	0.3	0.99	535	0.134	0.462	2.850	0.196
1	70	65	105	0.3	1	540	0.143	0.435	2.733	0.203
1	70	65	105	0.3	1.01	545	0.153	0.514	3.123	0.210
1	70	65	105	0.5	0.4	360	0.024	0.442	2.644	0.084
1	70	65	105	0.5	0.6	540	0.024	0.291	1.827	0.078
1	70	65	105	0.5	0.8	720	0.031	0.219	1.421	0.088
1	70	65	105	0.5	0.9	810	0.050	0.250	1.675	0.113
1	70	65	105	0.5	0.95	855	0.091	0.339	2.075	0.138
1	70	65	105	0.5	0.97	873	0.096	0.303	1.876	0.141
1	70	65	105	0.5	0.99	891	0.107	0.273	1.651	0.141
1	70	65	105	0.5	1	900	0.118	0.340	2.018	0.149
1	70	65	105	0.5	1.01	909	0.119	0.327	1.855	0.145
1	70	65	105	0.7	0.4	504	0.013	0.183	1.238	0.050
1	70	65	105	0.7	0.6	756	0.015	0.182	1.226	0.061
1	70	65	105	0.7	0.8	1008	0.021	0.159	1.111	0.071
1	70	65	105	0.7	0.9	1134	0.036	0.131	0.865	0.078
1	70	65	105	0.7	0.95	1197	0.059	0.160	1.009	0.097
1	70	65	105	0.7	0.97	1222	0.065	0.193	1.203	0.104
1	70	65	105	0.7	0.99	1247	0.065	0.194	1.157	0.096
1	70	65	105	0.7	1	1260	0.066	0.208	1.267	0.103
1	70	65	105	0.7	1.01	1273	0.067	0.194	1.258	0.110
1	70	65	120	0.3	0.4	216	0.038	0.707	4.216	0.114
1	70	65	120	0.3	0.6	324	0.040	0.365	2.322	0.114
1	70	65	120	0.3	0.8	432	0.046	0.363	2.314	0.117
1	70	65	120	0.3	0.9	486	0.063	0.347	2.198	0.132
1	70	65	120	0.3	0.95	513	0.111	0.465	2.871	0.182
1	70	65	120	0.3	0.97	524	0.124	0.374	2.408	0.186
1	70	65	120	0.3	0.99	535	0.130	0.442	2.648	0.183
1	70	65	120	0.3	1	540	0.132	0.435	2.730	0.192
1	70	65	120	0.3	1.01	545	0.154	0.463	2.731	0.194
1	70	65	120	0.5	0.4	360	0.024	0.370	2.322	0.084
1	70	65	120	0.5	0.6	540	0.026	0.215	1.415	0.075
1	70	65	120	0.5	0.8	720	0.034	0.207	1.371	0.086
1	70	65	120	0.5	0.9	810	0.055	0.209	1.372	0.106
1	70	65	120	0.5	0.95	855	0.080	0.265	1.641	0.125
1	70	65	120	0.5	0.97	873	0.094	0.297	1.821	0.138
1	70	65	120	0.5	0.99	891	0.112	0.240	1.449	0.136
1	70	65	120	0.5	1	900	0.114	0.300	1.761	0.142
1	70	65	120	0.5	1.01	909	0.119	0.291	1.658	0.136
1	70	65	120	0.7	0.4	504	0.012	0.229	1.427	0.046
1	70	65	120	0.7	0.6	756	0.016	0.151	1.011	0.058
1	70	65	120	0.7	0.8	1008	0.019	0.125	0.834	0.057
1	70	65	120	0.7	0.9	1134	0.036	0.191	1.259	0.083
1	70	65	120	0.7	0.95	1197	0.063	0.187	1.162	0.098
1	70	65	120	0.7	0.97	1222	0.065	0.181	1.085	0.094
1	70	65	120	0.7	0.99	1247	0.063	0.192	1.134	0.093
1	70	65	120	0.7	1	1260	0.065	0.163	0.997	0.094
1	70	65	120	0.7	1.01	1273	0.067	0.188	1.173	0.100
1	70	60	60	0.3	0.4	216	0.030	1.130	6.345	0.105
1	70	60	60	0.3	0.6	324	0.031	0.777	4.404	0.109
1	70	60	60	0.3	0.8	432	0.044	0.605	3.693	0.145
1	70	60	60	0.3	0.9	486	0.058	0.667	4.136	0.179
1	70	60	60	0.3	0.95	513	0.101	0.659	4.048	0.209
1	70	60	60	0.3	0.97	524	0.112	0.712	4.199	0.214
1	70	60	60	0.3	0.99	535	0.124	0.688	4.140	0.221
1	70	60	60	0.3	1	540	0.122	0.725	4.368	0.221
1	70	60	60	0.3	1.01	545	0.134	0.732	4.341	0.230
1	70	60	60	0.5	0.4	360	0.019	0.494	2.914	0.074
1	70	60	60	0.5	0.6	540	0.021	0.437	2.613	0.086
1	70	60	60	0.5	0.8	720	0.027	0.294	1.914	0.102
1	70	60	60	0.5	0.9	810	0.040	0.355	2.279	0.129

A	B	C	D	E	F	G	H	I	J	K
1	70	60	60	0.5	0.95	855	0.060	0.339	2.209	0.152
1	70	60	60	0.5	0.97	873	0.084	0.360	2.274	0.163
1	70	60	60	0.5	0.99	891	0.095	0.366	2.270	0.165
1	70	60	60	0.5	1	900	0.100	0.424	2.564	0.170
1	70	60	60	0.5	1.01	909	0.115	0.388	2.272	0.167
1	70	60	60	0.7	0.4	504	0.011	0.279	1.686	0.050
1	70	60	60	0.7	0.6	756	0.013	0.220	1.417	0.061
1	70	60	60	0.7	0.8	1008	0.019	0.228	1.508	0.083
1	70	60	60	0.7	0.9	1134	0.029	0.247	1.589	0.098
1	70	60	60	0.7	0.95	1197	0.040	0.265	1.674	0.109
1	70	60	60	0.7	0.97	1222	0.052	0.278	1.763	0.124
1	70	60	60	0.7	0.99	1247	0.067	0.260	1.570	0.115
1	70	60	60	0.7	1	1260	0.068	0.290	1.730	0.124
1	70	60	60	0.7	1.01	1273	0.069	0.292	1.698	0.120
1	70	60	75	0.3	0.4	216	0.033	0.934	5.339	0.112
1	70	60	75	0.3	0.6	324	0.034	0.559	3.506	0.116
1	70	60	75	0.3	0.8	432	0.042	0.492	2.996	0.124
1	70	60	75	0.3	0.9	486	0.058	0.495	3.194	0.164
1	70	60	75	0.3	0.95	513	0.096	0.471	3.023	0.191
1	70	60	75	0.3	0.97	524	0.114	0.499	3.171	0.202
1	70	60	75	0.3	0.99	535	0.128	0.523	3.308	0.212
1	70	60	75	0.3	1	540	0.120	0.518	3.215	0.201
1	70	60	75	0.3	1.01	545	0.146	0.633	3.763	0.226
1	70	60	75	0.5	0.4	360	0.022	0.523	3.038	0.083
1	70	60	75	0.5	0.6	540	0.022	0.244	1.630	0.082
1	70	60	75	0.5	0.8	720	0.028	0.289	1.838	0.093
1	70	60	75	0.5	0.9	810	0.043	0.288	1.887	0.117
1	70	60	75	0.5	0.95	855	0.063	0.318	1.994	0.134
1	70	60	75	0.5	0.97	873	0.078	0.329	2.018	0.142
1	70	60	75	0.5	0.99	891	0.092	0.344	2.085	0.152
1	70	60	75	0.5	1	900	0.109	0.356	2.130	0.156
1	70	60	75	0.5	1.01	909	0.112	0.388	2.217	0.153
1	70	60	75	0.7	0.4	504	0.014	0.311	1.856	0.056
1	70	60	75	0.7	0.6	756	0.013	0.176	1.176	0.059
1	70	60	75	0.7	0.8	1008	0.020	0.186	1.232	0.073
1	70	60	75	0.7	0.9	1134	0.033	0.211	1.355	0.090
1	70	60	75	0.7	0.95	1197	0.043	0.229	1.416	0.098
1	70	60	75	0.7	0.97	1222	0.057	0.212	1.308	0.106
1	70	60	75	0.7	0.99	1247	0.068	0.219	1.260	0.103
1	70	60	75	0.7	1	1260	0.066	0.250	1.454	0.106
1	70	60	75	0.7	1.01	1273	0.066	0.225	1.303	0.107
1	70	60	90	0.3	0.4	216	0.035	0.864	5.014	0.111
1	70	60	90	0.3	0.6	324	0.034	0.548	3.205	0.103
1	70	60	90	0.3	0.8	432	0.041	0.397	2.507	0.122
1	70	60	90	0.3	0.9	486	0.055	0.393	2.517	0.143
1	70	60	90	0.3	0.95	513	0.103	0.466	2.891	0.187
1	70	60	90	0.3	0.97	524	0.105	0.485	2.937	0.183
1	70	60	90	0.3	0.99	535	0.125	0.485	2.949	0.198
1	70	60	90	0.3	1	540	0.132	0.496	2.989	0.200
1	70	60	90	0.3	1.01	545	0.141	0.520	3.134	0.207
1	70	60	90	0.5	0.4	360	0.022	0.489	2.795	0.075
1	70	60	90	0.5	0.6	540	0.024	0.278	1.777	0.084
1	70	60	90	0.5	0.8	720	0.030	0.209	1.390	0.089
1	70	60	90	0.5	0.9	810	0.041	0.251	1.642	0.105
1	70	60	90	0.5	0.95	855	0.064	0.244	1.542	0.121
1	70	60	90	0.5	0.97	873	0.078	0.284	1.712	0.131
1	70	60	90	0.5	0.99	891	0.091	0.276	1.647	0.135
1	70	60	90	0.5	1	900	0.108	0.320	1.814	0.139
1	70	60	90	0.5	1.01	909	0.110	0.290	1.614	0.135
1	70	60	90	0.7	0.4	504	0.014	0.301	1.840	0.060
1	70	60	90	0.7	0.6	756	0.011	0.173	1.080	0.046
1	70	60	90	0.7	0.8	1008	0.020	0.172	1.133	0.068
1	70	60	90	0.7	0.9	1134	0.031	0.195	1.203	0.075
1	70	60	90	0.7	0.95	1197	0.045	0.188	1.222	0.096
1	70	60	90	0.7	0.97	1222	0.056	0.173	1.097	0.099
1	70	60	90	0.7	0.99	1247	0.066	0.197	1.158	0.099
1	70	60	90	0.7	1	1260	0.065	0.216	1.223	0.095
1	70	60	90	0.7	1.01	1273	0.066	0.198	1.159	0.100

A	B	C	D	E	F	G	H	I	J	K
1	70	60	105	0.3	0.4	216	0.038	0.746	4.470	0.118
1	70	60	105	0.3	0.6	324	0.038	0.528	3.179	0.108
1	70	60	105	0.3	0.8	432	0.045	0.383	2.422	0.121
1	70	60	105	0.3	0.9	486	0.057	0.332	2.113	0.129
1	70	60	105	0.3	0.95	513	0.097	0.393	2.512	0.170
1	70	60	105	0.3	0.97	524	0.116	0.445	2.695	0.182
1	70	60	105	0.3	0.99	535	0.122	0.442	2.715	0.188
1	70	60	105	0.3	1	540	0.133	0.399	2.559	0.193
1	70	60	105	0.3	1.01	545	0.136	0.437	2.608	0.193
1	70	60	105	0.5	0.4	360	0.023	0.415	2.461	0.082
1	70	60	105	0.5	0.6	540	0.024	0.275	1.699	0.075
1	70	60	105	0.5	0.8	720	0.030	0.203	1.276	0.081
1	70	60	105	0.5	0.9	810	0.040	0.195	1.297	0.094
1	70	60	105	0.5	0.95	855	0.067	0.254	1.588	0.116
1	70	60	105	0.5	0.97	873	0.074	0.250	1.576	0.121
1	70	60	105	0.5	0.99	891	0.093	0.286	1.745	0.133
1	70	60	105	0.5	1	900	0.106	0.267	1.568	0.133
1	70	60	105	0.5	1.01	909	0.118	0.301	1.645	0.135
1	70	60	105	0.7	0.4	504	0.013	0.175	1.174	0.050
1	70	60	105	0.7	0.6	756	0.015	0.159	1.092	0.059
1	70	60	105	0.7	0.8	1008	0.020	0.155	1.025	0.064
1	70	60	105	0.7	0.9	1134	0.030	0.129	0.869	0.072
1	70	60	105	0.7	0.95	1197	0.043	0.176	1.156	0.090
1	70	60	105	0.7	0.97	1222	0.056	0.170	1.040	0.090
1	70	60	105	0.7	0.99	1247	0.065	0.175	0.955	0.083
1	70	60	105	0.7	1	1260	0.064	0.170	0.973	0.089
1	70	60	105	0.7	1.01	1273	0.065	0.200	1.140	0.091
1	70	60	120	0.3	0.4	216	0.037	0.681	4.026	0.113
1	70	60	120	0.3	0.6	324	0.040	0.354	2.223	0.109
1	70	60	120	0.3	0.8	432	0.044	0.399	2.512	0.118
1	70	60	120	0.3	0.9	486	0.059	0.304	1.929	0.122
1	70	60	120	0.3	0.95	513	0.099	0.396	2.426	0.163
1	70	60	120	0.3	0.97	524	0.114	0.353	2.289	0.177
1	70	60	120	0.3	0.99	535	0.124	0.381	2.273	0.171
1	70	60	120	0.3	1	540	0.123	0.409	2.557	0.183
1	70	60	120	0.3	1.01	545	0.140	0.394	2.382	0.179
1	70	60	120	0.5	0.4	360	0.024	0.345	2.147	0.082
1	70	60	120	0.5	0.6	540	0.026	0.199	1.304	0.072
1	70	60	120	0.5	0.8	720	0.032	0.217	1.424	0.082
1	70	60	120	0.5	0.9	810	0.048	0.178	1.165	0.093
1	70	60	120	0.5	0.95	855	0.068	0.260	1.574	0.108
1	70	60	120	0.5	0.97	873	0.080	0.241	1.536	0.125
1	70	60	120	0.5	0.99	891	0.099	0.241	1.459	0.125
1	70	60	120	0.5	1	900	0.103	0.298	1.755	0.132
1	70	60	120	0.5	1.01	909	0.115	0.292	1.608	0.123
1	70	60	120	0.7	0.4	504	0.012	0.207	1.287	0.045
1	70	60	120	0.7	0.6	756	0.016	0.138	0.924	0.055
1	70	60	120	0.7	0.8	1008	0.017	0.110	0.732	0.051
1	70	60	120	0.7	0.9	1134	0.031	0.163	1.065	0.072
1	70	60	120	0.7	0.95	1197	0.047	0.157	0.965	0.079
1	70	60	120	0.7	0.97	1222	0.062	0.190	1.117	0.085
1	70	60	120	0.7	0.99	1247	0.064	0.166	0.911	0.079
1	70	60	120	0.7	1	1260	0.064	0.154	0.875	0.081
1	70	60	120	0.7	1.01	1273	0.065	0.164	0.897	0.083
1	70	50	60	0.3	0.4	216	0.029	0.921	5.199	0.106
1	70	50	60	0.3	0.6	324	0.029	0.622	3.581	0.103
1	70	50	60	0.3	0.8	432	0.038	0.450	2.806	0.123
1	70	50	60	0.3	0.9	486	0.049	0.457	2.799	0.144
1	70	50	60	0.3	0.95	513	0.076	0.439	2.752	0.171
1	70	50	60	0.3	0.97	524	0.094	0.518	3.073	0.181
1	70	50	60	0.3	0.99	535	0.095	0.482	2.954	0.186
1	70	50	60	0.3	1	540	0.101	0.529	3.168	0.188
1	70	50	60	0.3	1.01	545	0.120	0.555	3.328	0.203
1	70	50	60	0.5	0.4	360	0.018	0.408	2.388	0.071
1	70	50	60	0.5	0.6	540	0.021	0.340	2.025	0.081
1	70	50	60	0.5	0.8	720	0.025	0.229	1.490	0.090
1	70	50	60	0.5	0.9	810	0.032	0.223	1.433	0.096
1	70	50	60	0.5	0.95	855	0.043	0.251	1.667	0.115

A	B	C	D	E	F	G	H	I	J	K
1	70	50	60	0.5	0.97	873	0.055	0.284	1.765	0.117
1	70	50	60	0.5	0.99	891	0.070	0.266	1.604	0.127
1	70	50	60	0.5	1	900	0.073	0.281	1.703	0.130
1	70	50	60	0.5	1.01	909	0.090	0.312	1.925	0.138
1	70	50	60	0.7	0.4	504	0.011	0.211	1.325	0.048
1	70	50	60	0.7	0.6	756	0.013	0.173	1.086	0.054
1	70	50	60	0.7	0.8	1008	0.017	0.174	1.119	0.069
1	70	50	60	0.7	0.9	1134	0.023	0.178	1.148	0.074
1	70	50	60	0.7	0.95	1197	0.030	0.176	1.174	0.081
1	70	50	60	0.7	0.97	1222	0.034	0.173	1.113	0.085
1	70	50	60	0.7	0.99	1247	0.044	0.193	1.169	0.089
1	70	50	60	0.7	1	1260	0.060	0.224	1.274	0.097
1	70	50	60	0.7	1.01	1273	0.066	0.225	1.260	0.099
1	70	50	75	0.3	0.4	216	0.033	0.754	4.296	0.113
1	70	50	75	0.3	0.6	324	0.032	0.394	2.541	0.105
1	70	50	75	0.3	0.8	432	0.039	0.350	2.219	0.107
1	70	50	75	0.3	0.9	486	0.050	0.400	2.533	0.136
1	70	50	75	0.3	0.95	513	0.069	0.345	2.163	0.146
1	70	50	75	0.3	0.97	524	0.086	0.369	2.273	0.160
1	70	50	75	0.3	0.99	535	0.097	0.375	2.335	0.170
1	70	50	75	0.3	1	540	0.090	0.381	2.291	0.158
1	70	50	75	0.3	1.01	545	0.108	0.438	2.651	0.175
1	70	50	75	0.5	0.4	360	0.022	0.406	2.405	0.080
1	70	50	75	0.5	0.6	540	0.021	0.187	1.242	0.073
1	70	50	75	0.5	0.8	720	0.024	0.201	1.290	0.076
1	70	50	75	0.5	0.9	810	0.033	0.182	1.207	0.089
1	70	50	75	0.5	0.95	855	0.044	0.215	1.401	0.099
1	70	50	75	0.5	0.97	873	0.049	0.217	1.341	0.099
1	70	50	75	0.5	0.99	891	0.058	0.226	1.403	0.108
1	70	50	75	0.5	1	900	0.079	0.269	1.610	0.121
1	70	50	75	0.5	1.01	909	0.088	0.260	1.565	0.121
1	70	50	75	0.7	0.4	504	0.013	0.247	1.497	0.054
1	70	50	75	0.7	0.6	756	0.013	0.133	0.902	0.053
1	70	50	75	0.7	0.8	1008	0.017	0.135	0.888	0.058
1	70	50	75	0.7	0.9	1134	0.024	0.136	0.915	0.066
1	70	50	75	0.7	0.95	1197	0.030	0.143	0.925	0.070
1	70	50	75	0.7	0.97	1222	0.034	0.143	0.903	0.074
1	70	50	75	0.7	0.99	1247	0.049	0.155	0.910	0.080
1	70	50	75	0.7	1	1260	0.060	0.171	0.998	0.084
1	70	50	75	0.7	1.01	1273	0.065	0.179	0.918	0.085
1	70	50	90	0.3	0.4	216	0.034	0.661	3.832	0.109
1	70	50	90	0.3	0.6	324	0.032	0.399	2.426	0.095
1	70	50	90	0.3	0.8	432	0.039	0.292	1.817	0.102
1	70	50	90	0.3	0.9	486	0.046	0.246	1.571	0.109
1	70	50	90	0.3	0.95	513	0.078	0.363	2.225	0.140
1	70	50	90	0.3	0.97	524	0.081	0.295	1.793	0.134
1	70	50	90	0.3	0.99	535	0.095	0.421	2.471	0.153
1	70	50	90	0.3	1	540	0.101	0.412	2.487	0.163
1	70	50	90	0.3	1.01	545	0.111	0.436	2.585	0.165
1	70	50	90	0.5	0.4	360	0.021	0.391	2.293	0.071
1	70	50	90	0.5	0.6	540	0.023	0.222	1.378	0.071
1	70	50	90	0.5	0.8	720	0.027	0.164	1.067	0.073
1	70	50	90	0.5	0.9	810	0.031	0.162	1.071	0.075
1	70	50	90	0.5	0.95	855	0.043	0.200	1.243	0.085
1	70	50	90	0.5	0.97	873	0.055	0.223	1.339	0.095
1	70	50	90	0.5	0.99	891	0.067	0.207	1.259	0.101
1	70	50	90	0.5	1	900	0.079	0.267	1.561	0.113
1	70	50	90	0.5	1.01	909	0.089	0.233	1.352	0.109
1	70	50	90	0.7	0.4	504	0.013	0.229	1.396	0.055
1	70	50	90	0.7	0.6	756	0.010	0.131	0.821	0.038
1	70	50	90	0.7	0.8	1008	0.017	0.116	0.762	0.053
1	70	50	90	0.7	0.9	1134	0.024	0.104	0.666	0.052
1	70	50	90	0.7	0.95	1197	0.032	0.125	0.805	0.066
1	70	50	90	0.7	0.97	1222	0.035	0.137	0.848	0.067
1	70	50	90	0.7	0.99	1247	0.049	0.135	0.840	0.076
1	70	50	90	0.7	1	1260	0.063	0.167	0.882	0.075
1	70	50	90	0.7	1.01	1273	0.063	0.128	0.688	0.075
1	70	50	105	0.3	0.4	216	0.038	0.576	3.530	0.115

A	B	C	D	E	F	G	H	I	J	K
1	70	50	105	0.3	0.6	324	0.036	0.408	2.498	0.100
1	70	50	105	0.3	0.8	432	0.042	0.310	1.934	0.104
1	70	50	105	0.3	0.9	486	0.049	0.252	1.569	0.102
1	70	50	105	0.3	0.95	513	0.074	0.262	1.645	0.124
1	70	50	105	0.3	0.97	524	0.083	0.280	1.709	0.129
1	70	50	105	0.3	0.99	535	0.095	0.322	1.928	0.139
1	70	50	105	0.3	1	540	0.104	0.309	1.895	0.147
1	70	50	105	0.3	1.01	545	0.118	0.366	2.169	0.156
1	70	50	105	0.5	0.4	360	0.022	0.316	1.883	0.075
1	70	50	105	0.5	0.6	540	0.023	0.205	1.270	0.064
1	70	50	105	0.5	0.8	720	0.027	0.147	0.922	0.065
1	70	50	105	0.5	0.9	810	0.036	0.163	1.009	0.073
1	70	50	105	0.5	0.95	855	0.047	0.188	1.162	0.085
1	70	50	105	0.5	0.97	873	0.052	0.183	1.083	0.081
1	70	50	105	0.5	0.99	891	0.060	0.165	1.032	0.088
1	70	50	105	0.5	1	900	0.079	0.239	1.361	0.105
1	70	50	105	0.5	1.01	909	0.100	0.205	1.208	0.107
1	70	50	105	0.7	0.4	504	0.012	0.146	0.957	0.044
1	70	50	105	0.7	0.6	756	0.014	0.102	0.699	0.048
1	70	50	105	0.7	0.8	1008	0.017	0.112	0.722	0.048
1	70	50	105	0.7	0.9	1134	0.023	0.094	0.624	0.052
1	70	50	105	0.7	0.95	1197	0.031	0.118	0.734	0.056
1	70	50	105	0.7	0.97	1222	0.036	0.114	0.700	0.062
1	70	50	105	0.7	0.99	1247	0.053	0.134	0.762	0.066
1	70	50	105	0.7	1	1260	0.064	0.145	0.614	0.065
1	70	50	105	0.7	1.01	1273	0.064	0.115	0.465	0.063
1	70	50	120	0.3	0.4	216	0.036	0.532	3.136	0.105
1	70	50	120	0.3	0.6	324	0.038	0.285	1.771	0.094
1	70	50	120	0.3	0.8	432	0.042	0.272	1.716	0.094
1	70	50	120	0.3	0.9	486	0.050	0.264	1.592	0.093
1	70	50	120	0.3	0.95	513	0.077	0.294	1.757	0.118
1	70	50	120	0.3	0.97	524	0.091	0.276	1.690	0.131
1	70	50	120	0.3	0.99	535	0.089	0.282	1.725	0.129
1	70	50	120	0.3	1	540	0.097	0.288	1.718	0.131
1	70	50	120	0.3	1.01	545	0.113	0.332	1.918	0.139
1	70	50	120	0.5	0.4	360	0.022	0.273	1.640	0.072
1	70	50	120	0.5	0.6	540	0.025	0.144	0.951	0.062
1	70	50	120	0.5	0.8	720	0.029	0.157	1.002	0.065
1	70	50	120	0.5	0.9	810	0.038	0.140	0.860	0.068
1	70	50	120	0.5	0.95	855	0.047	0.148	0.894	0.071
1	70	50	120	0.5	0.97	873	0.059	0.170	1.040	0.086
1	70	50	120	0.5	0.99	891	0.073	0.194	1.176	0.098
1	70	50	120	0.5	1	900	0.082	0.229	1.339	0.097
1	70	50	120	0.5	1.01	909	0.100	0.191	1.096	0.098
1	70	50	120	0.7	0.4	504	0.011	0.184	1.087	0.041
1	70	50	120	0.7	0.6	756	0.015	0.104	0.679	0.046
1	70	50	120	0.7	0.8	1008	0.015	0.096	0.616	0.039
1	70	50	120	0.7	0.9	1134	0.025	0.117	0.730	0.052
1	70	50	120	0.7	0.95	1197	0.033	0.087	0.559	0.053
1	70	50	120	0.7	0.97	1222	0.038	0.123	0.715	0.056
1	70	50	120	0.7	0.99	1247	0.053	0.139	0.791	0.064
1	70	50	120	0.7	1	1260	0.061	0.106	0.431	0.056
1	70	50	120	0.7	1.01	1273	0.064	0.111	0.396	0.055
1	60	55	60	0.3	0.4	216	0.028	0.252	2.186	0.099
1	60	55	60	0.3	0.6	324	0.030	0.174	1.561	0.102
1	60	55	60	0.3	0.8	432	0.040	0.165	1.516	0.126
1	60	55	60	0.3	0.9	486	0.058	0.178	1.599	0.154
1	60	55	60	0.3	0.95	513	0.112	0.226	1.811	0.188
1	60	55	60	0.3	0.97	524	0.117	0.238	1.946	0.198
1	60	55	60	0.3	0.99	535	0.134	0.251	1.943	0.204
1	60	55	60	0.3	1	540	0.138	0.263	2.064	0.212
1	60	55	60	0.3	1.01	545	0.166	0.281	2.086	0.223
1	60	55	60	0.5	0.4	360	0.017	0.163	1.389	0.068
1	60	55	60	0.5	0.6	540	0.021	0.107	1.001	0.078
1	60	55	60	0.5	0.8	720	0.025	0.088	0.842	0.082
1	60	55	60	0.5	0.9	810	0.043	0.104	0.944	0.107
1	60	55	60	0.5	0.95	855	0.078	0.148	1.155	0.134
1	60	55	60	0.5	0.97	873	0.091	0.155	1.188	0.144

A	B	C	D	E	F	G	H	I	J	K
1	60	55	60	0.5	0.99	891	0.109	0.168	1.174	0.144
1	60	55	60	0.5	1	900	0.111	0.165	1.180	0.151
1	60	55	60	0.5	1.01	909	0.120	0.178	1.213	0.152
1	60	55	60	0.7	0.4	504	0.008	0.067	0.595	0.036
1	60	55	60	0.7	0.6	756	0.012	0.070	0.640	0.048
1	60	55	60	0.7	0.8	1008	0.017	0.056	0.571	0.064
1	60	55	60	0.7	0.9	1134	0.031	0.078	0.705	0.082
1	60	55	60	0.7	0.95	1197	0.059	0.101	0.759	0.100
1	60	55	60	0.7	0.97	1222	0.063	0.105	0.770	0.100
1	60	55	60	0.7	0.99	1247	0.062	0.102	0.765	0.101
1	60	55	60	0.7	1	1260	0.063	0.104	0.767	0.102
1	60	55	60	0.7	1.01	1273	0.064	0.106	0.792	0.104
1	60	55	75	0.3	0.4	216	0.030	0.260	2.177	0.104
1	60	55	75	0.3	0.6	324	0.033	0.160	1.459	0.104
1	60	55	75	0.3	0.8	432	0.041	0.160	1.456	0.121
1	60	55	75	0.3	0.9	486	0.053	0.136	1.197	0.126
1	60	55	75	0.3	0.95	513	0.103	0.204	1.628	0.172
1	60	55	75	0.3	0.97	524	0.108	0.183	1.408	0.164
1	60	55	75	0.3	0.99	535	0.123	0.199	1.499	0.176
1	60	55	75	0.3	1	540	0.130	0.228	1.728	0.186
1	60	55	75	0.3	1.01	545	0.143	0.215	1.580	0.189
1	60	55	75	0.5	0.4	360	0.020	0.137	1.187	0.069
1	60	55	75	0.5	0.6	540	0.017	0.068	0.637	0.058
1	60	55	75	0.5	0.8	720	0.025	0.077	0.726	0.077
1	60	55	75	0.5	0.9	810	0.046	0.096	0.839	0.101
1	60	55	75	0.5	0.95	855	0.079	0.126	0.958	0.122
1	60	55	75	0.5	0.97	873	0.095	0.137	0.960	0.127
1	60	55	75	0.5	0.99	891	0.111	0.147	0.972	0.133
1	60	55	75	0.5	1	900	0.114	0.162	1.080	0.137
1	60	55	75	0.5	1.01	909	0.116	0.175	1.210	0.147
1	60	55	75	0.7	0.4	504	0.011	0.069	0.649	0.048
1	60	55	75	0.7	0.6	756	0.010	0.042	0.423	0.040
1	60	55	75	0.7	0.8	1008	0.018	0.052	0.511	0.059
1	60	55	75	0.7	0.9	1134	0.035	0.075	0.637	0.078
1	60	55	75	0.7	0.95	1197	0.057	0.093	0.706	0.094
1	60	55	75	0.7	0.97	1222	0.061	0.096	0.697	0.094
1	60	55	75	0.7	0.99	1247	0.062	0.098	0.716	0.094
1	60	55	75	0.7	1	1260	0.061	0.087	0.610	0.089
1	60	55	75	0.7	1.01	1273	0.062	0.098	0.703	0.095
1	60	55	90	0.3	0.4	216	0.032	0.197	1.764	0.102
1	60	55	90	0.3	0.6	324	0.030	0.132	1.181	0.087
1	60	55	90	0.3	0.8	432	0.038	0.120	1.052	0.098
1	60	55	90	0.3	0.9	486	0.047	0.117	1.032	0.110
1	60	55	90	0.3	0.95	513	0.109	0.191	1.476	0.164
1	60	55	90	0.3	0.97	524	0.115	0.184	1.398	0.167
1	60	55	90	0.3	0.99	535	0.119	0.187	1.397	0.167
1	60	55	90	0.3	1	540	0.137	0.200	1.463	0.179
1	60	55	90	0.3	1.01	545	0.166	0.242	1.675	0.195
1	60	55	90	0.5	0.4	360	0.020	0.109	0.966	0.065
1	60	55	90	0.5	0.6	540	0.019	0.078	0.708	0.061
1	60	55	90	0.5	0.8	720	0.028	0.070	0.634	0.071
1	60	55	90	0.5	0.9	810	0.045	0.085	0.745	0.094
1	60	55	90	0.5	0.95	855	0.082	0.123	0.892	0.113
1	60	55	90	0.5	0.97	873	0.094	0.132	0.913	0.120
1	60	55	90	0.5	0.99	891	0.106	0.142	0.935	0.125
1	60	55	90	0.5	1	900	0.112	0.151	0.964	0.125
1	60	55	90	0.5	1.01	909	0.111	0.144	0.917	0.124
1	60	55	90	0.7	0.4	504	0.013	0.064	0.599	0.048
1	60	55	90	0.7	0.6	756	0.012	0.054	0.511	0.042
1	60	55	90	0.7	0.8	1008	0.018	0.045	0.432	0.053
1	60	55	90	0.7	0.9	1134	0.033	0.066	0.560	0.070
1	60	55	90	0.7	0.95	1197	0.061	0.092	0.641	0.085
1	60	55	90	0.7	0.97	1222	0.060	0.089	0.608	0.081
1	60	55	90	0.7	0.99	1247	0.061	0.093	0.658	0.087
1	60	55	90	0.7	1	1260	0.060	0.088	0.623	0.086
1	60	55	90	0.7	1.01	1273	0.061	0.093	0.662	0.088
1	60	55	105	0.3	0.4	216	0.034	0.174	1.560	0.101
1	60	55	105	0.3	0.6	324	0.033	0.104	0.949	0.085

A	B	C	D	E	F	G	H	I	J	K
1	60	55	105	0.3	0.8	432	0.041	0.108	0.988	0.100
1	60	55	105	0.3	0.9	486	0.063	0.124	1.069	0.122
1	60	55	105	0.3	0.95	513	0.104	0.162	1.247	0.152
1	60	55	105	0.3	0.97	524	0.125	0.197	1.447	0.165
1	60	55	105	0.3	0.99	535	0.123	0.189	1.390	0.163
1	60	55	105	0.3	1	540	0.137	0.204	1.481	0.176
1	60	55	105	0.3	1.01	545	0.153	0.215	1.465	0.174
1	60	55	105	0.5	0.4	360	0.022	0.110	0.962	0.067
1	60	55	105	0.5	0.6	540	0.020	0.078	0.714	0.063
1	60	55	105	0.5	0.8	720	0.028	0.059	0.530	0.066
1	60	55	105	0.5	0.9	810	0.044	0.082	0.701	0.085
1	60	55	105	0.5	0.95	855	0.079	0.121	0.887	0.108
1	60	55	105	0.5	0.97	873	0.086	0.129	0.905	0.112
1	60	55	105	0.5	0.99	891	0.107	0.135	0.869	0.118
1	60	55	105	0.5	1	900	0.110	0.150	0.977	0.122
1	60	55	105	0.5	1.01	909	0.116	0.143	0.887	0.122
1	60	55	105	0.7	0.4	504	0.011	0.059	0.534	0.039
1	60	55	105	0.7	0.6	756	0.012	0.038	0.355	0.038
1	60	55	105	0.7	0.8	1008	0.017	0.039	0.366	0.046
1	60	55	105	0.7	0.9	1134	0.032	0.057	0.469	0.062
1	60	55	105	0.7	0.95	1197	0.059	0.082	0.561	0.079
1	60	55	105	0.7	0.97	1222	0.060	0.077	0.516	0.076
1	60	55	105	0.7	0.99	1247	0.061	0.078	0.521	0.078
1	60	55	105	0.7	1	1260	0.060	0.082	0.571	0.081
1	60	55	105	0.7	1.01	1273	0.060	0.085	0.584	0.080
1	60	55	120	0.3	0.4	216	0.032	0.180	1.560	0.093
1	60	55	120	0.3	0.6	324	0.033	0.113	0.991	0.087
1	60	55	120	0.3	0.8	432	0.045	0.102	0.884	0.093
1	60	55	120	0.3	0.9	486	0.059	0.117	0.977	0.108
1	60	55	120	0.3	0.95	513	0.115	0.161	1.156	0.144
1	60	55	120	0.3	0.97	524	0.121	0.159	1.121	0.146
1	60	55	120	0.3	0.99	535	0.144	0.204	1.423	0.171
1	60	55	120	0.3	1	540	0.138	0.183	1.252	0.158
1	60	55	120	0.3	1.01	545	0.149	0.206	1.413	0.169
1	60	55	120	0.5	0.4	360	0.023	0.090	0.825	0.067
1	60	55	120	0.5	0.6	540	0.024	0.070	0.625	0.062
1	60	55	120	0.5	0.8	720	0.030	0.058	0.520	0.065
1	60	55	120	0.5	0.9	810	0.048	0.084	0.657	0.079
1	60	55	120	0.5	0.95	855	0.091	0.121	0.858	0.114
1	60	55	120	0.5	0.97	873	0.103	0.128	0.821	0.110
1	60	55	120	0.5	0.99	891	0.109	0.134	0.844	0.113
1	60	55	120	0.5	1	900	0.112	0.142	0.915	0.121
1	60	55	120	0.5	1.01	909	0.115	0.144	0.901	0.120
1	60	55	120	0.7	0.4	504	0.011	0.054	0.517	0.040
1	60	55	120	0.7	0.6	756	0.013	0.036	0.342	0.040
1	60	55	120	0.7	0.8	1008	0.017	0.034	0.323	0.043
1	60	55	120	0.7	0.9	1134	0.034	0.054	0.433	0.062
1	60	55	120	0.7	0.95	1197	0.060	0.078	0.515	0.074
1	60	55	120	0.7	0.97	1222	0.060	0.073	0.478	0.072
1	60	55	120	0.7	0.99	1247	0.059	0.074	0.491	0.072
1	60	55	120	0.7	1	1260	0.059	0.078	0.511	0.074
1	60	55	120	0.7	1.01	1273	0.060	0.080	0.537	0.076
1	60	50	60	0.3	0.4	216	0.028	0.233	2.029	0.098
1	60	50	60	0.3	0.6	324	0.029	0.156	1.422	0.099
1	60	50	60	0.3	0.8	432	0.037	0.160	1.442	0.117
1	60	50	60	0.3	0.9	486	0.051	0.175	1.569	0.144
1	60	50	60	0.3	0.95	513	0.081	0.189	1.545	0.159
1	60	50	60	0.3	0.97	524	0.096	0.192	1.576	0.171
1	60	50	60	0.3	0.99	535	0.105	0.206	1.646	0.177
1	60	50	60	0.3	1	540	0.116	0.211	1.649	0.185
1	60	50	60	0.3	1.01	545	0.130	0.238	1.798	0.193
1	60	50	60	0.5	0.4	360	0.017	0.153	1.292	0.066
1	60	50	60	0.5	0.6	540	0.020	0.094	0.879	0.072
1	60	50	60	0.5	0.8	720	0.024	0.079	0.755	0.077
1	60	50	60	0.5	0.9	810	0.035	0.086	0.801	0.093
1	60	50	60	0.5	0.95	855	0.049	0.109	0.945	0.107
1	60	50	60	0.5	0.97	873	0.068	0.121	0.989	0.124
1	60	50	60	0.5	0.99	891	0.085	0.138	1.036	0.130

A	B	C	D	E	F	G	H	I	J	K
1	60	50	60	0.5	1	900	0.097	0.143	1.024	0.135
1	60	50	60	0.5	1.01	909	0.115	0.157	1.050	0.139
1	60	50	60	0.7	0.4	504	0.008	0.065	0.573	0.034
1	60	50	60	0.7	0.6	756	0.012	0.056	0.529	0.043
1	60	50	60	0.7	0.8	1008	0.015	0.046	0.472	0.057
1	60	50	60	0.7	0.9	1134	0.026	0.066	0.622	0.073
1	60	50	60	0.7	0.95	1197	0.039	0.076	0.645	0.082
1	60	50	60	0.7	0.97	1222	0.052	0.089	0.700	0.091
1	60	50	60	0.7	0.99	1247	0.062	0.097	0.689	0.092
1	60	50	60	0.7	1	1260	0.063	0.096	0.667	0.091
1	60	50	60	0.7	1.01	1273	0.064	0.099	0.694	0.094
1	60	50	75	0.3	0.4	216	0.030	0.247	2.041	0.101
1	60	50	75	0.3	0.6	324	0.033	0.161	1.414	0.100
1	60	50	75	0.3	0.8	432	0.038	0.145	1.281	0.107
1	60	50	75	0.3	0.9	486	0.048	0.124	1.118	0.120
1	60	50	75	0.3	0.95	513	0.085	0.172	1.380	0.150
1	60	50	75	0.3	0.97	524	0.100	0.181	1.361	0.152
1	60	50	75	0.3	0.99	535	0.110	0.193	1.465	0.164
1	60	50	75	0.3	1	540	0.111	0.188	1.430	0.166
1	60	50	75	0.3	1.01	545	0.131	0.213	1.554	0.179
1	60	50	75	0.5	0.4	360	0.019	0.132	1.118	0.068
1	60	50	75	0.5	0.6	540	0.016	0.063	0.581	0.054
1	60	50	75	0.5	0.8	720	0.023	0.072	0.672	0.070
1	60	50	75	0.5	0.9	810	0.037	0.083	0.739	0.086
1	60	50	75	0.5	0.95	855	0.062	0.099	0.787	0.103
1	60	50	75	0.5	0.97	873	0.067	0.103	0.785	0.105
1	60	50	75	0.5	0.99	891	0.087	0.120	0.848	0.116
1	60	50	75	0.5	1	900	0.103	0.144	0.982	0.127
1	60	50	75	0.5	1.01	909	0.110	0.145	0.924	0.122
1	60	50	75	0.7	0.4	504	0.011	0.061	0.585	0.045
1	60	50	75	0.7	0.6	756	0.010	0.039	0.386	0.036
1	60	50	75	0.7	0.8	1008	0.017	0.047	0.466	0.055
1	60	50	75	0.7	0.9	1134	0.029	0.064	0.558	0.066
1	60	50	75	0.7	0.95	1197	0.038	0.070	0.603	0.077
1	60	50	75	0.7	0.97	1222	0.051	0.082	0.638	0.083
1	60	50	75	0.7	0.99	1247	0.062	0.091	0.624	0.083
1	60	50	75	0.7	1	1260	0.061	0.085	0.582	0.084
1	60	50	75	0.7	1.01	1273	0.062	0.089	0.591	0.083
1	60	50	90	0.3	0.4	216	0.032	0.185	1.647	0.099
1	60	50	90	0.3	0.6	324	0.030	0.121	1.080	0.084
1	60	50	90	0.3	0.8	432	0.036	0.107	0.920	0.088
1	60	50	90	0.3	0.9	486	0.042	0.102	0.868	0.095
1	60	50	90	0.3	0.95	513	0.094	0.166	1.306	0.150
1	60	50	90	0.3	0.97	524	0.099	0.171	1.295	0.146
1	60	50	90	0.3	0.99	535	0.111	0.173	1.268	0.151
1	60	50	90	0.3	1	540	0.110	0.181	1.329	0.152
1	60	50	90	0.3	1.01	545	0.133	0.196	1.422	0.173
1	60	50	90	0.5	0.4	360	0.020	0.103	0.891	0.063
1	60	50	90	0.5	0.6	540	0.018	0.072	0.644	0.056
1	60	50	90	0.5	0.8	720	0.026	0.068	0.608	0.068
1	60	50	90	0.5	0.9	810	0.038	0.074	0.650	0.080
1	60	50	90	0.5	0.95	855	0.063	0.097	0.722	0.092
1	60	50	90	0.5	0.97	873	0.074	0.108	0.766	0.100
1	60	50	90	0.5	0.99	891	0.088	0.123	0.844	0.108
1	60	50	90	0.5	1	900	0.102	0.139	0.925	0.118
1	60	50	90	0.5	1.01	909	0.105	0.137	0.849	0.109
1	60	50	90	0.7	0.4	504	0.013	0.060	0.552	0.046
1	60	50	90	0.7	0.6	756	0.011	0.051	0.474	0.040
1	60	50	90	0.7	0.8	1008	0.016	0.039	0.378	0.048
1	60	50	90	0.7	0.9	1134	0.026	0.059	0.493	0.054
1	60	50	90	0.7	0.95	1197	0.045	0.067	0.498	0.069
1	60	50	90	0.7	0.97	1222	0.049	0.068	0.485	0.069
1	60	50	90	0.7	0.99	1247	0.060	0.080	0.498	0.071
1	60	50	90	0.7	1	1260	0.060	0.080	0.515	0.074
1	60	50	90	0.7	1.01	1273	0.060	0.082	0.529	0.074
1	60	50	105	0.3	0.4	216	0.033	0.164	1.452	0.098
1	60	50	105	0.3	0.6	324	0.033	0.100	0.893	0.082
1	60	50	105	0.3	0.8	432	0.040	0.100	0.896	0.094

A	B	C	D	E	F	G	H	I	J	K
1	60	50	105	0.3	0.9	486	0.054	0.111	0.924	0.102
1	60	50	105	0.3	0.95	513	0.101	0.147	1.101	0.140
1	60	50	105	0.3	0.97	524	0.111	0.166	1.209	0.146
1	60	50	105	0.3	0.99	535	0.108	0.163	1.193	0.143
1	60	50	105	0.3	1	540	0.122	0.173	1.219	0.152
1	60	50	105	0.3	1.01	545	0.124	0.175	1.219	0.151
1	60	50	105	0.5	0.4	360	0.021	0.110	0.907	0.066
1	60	50	105	0.5	0.6	540	0.020	0.072	0.648	0.058
1	60	50	105	0.5	0.8	720	0.027	0.055	0.498	0.062
1	60	50	105	0.5	0.9	810	0.036	0.071	0.607	0.071
1	60	50	105	0.5	0.95	855	0.062	0.101	0.765	0.089
1	60	50	105	0.5	0.97	873	0.071	0.108	0.779	0.097
1	60	50	105	0.5	0.99	891	0.094	0.124	0.838	0.112
1	60	50	105	0.5	1	900	0.102	0.129	0.798	0.106
1	60	50	105	0.5	1.01	909	0.112	0.127	0.731	0.104
1	60	50	105	0.7	0.4	504	0.011	0.055	0.495	0.037
1	60	50	105	0.7	0.6	756	0.012	0.036	0.329	0.035
1	60	50	105	0.7	0.8	1008	0.015	0.029	0.278	0.040
1	60	50	105	0.7	0.9	1134	0.026	0.048	0.385	0.050
1	60	50	105	0.7	0.95	1197	0.045	0.061	0.443	0.063
1	60	50	105	0.7	0.97	1222	0.055	0.072	0.501	0.069
1	60	50	105	0.7	0.99	1247	0.061	0.077	0.469	0.066
1	60	50	105	0.7	1	1260	0.060	0.070	0.406	0.065
1	60	50	105	0.7	1.01	1273	0.060	0.074	0.461	0.069
1	60	50	120	0.3	0.4	216	0.032	0.168	1.435	0.087
1	60	50	120	0.3	0.6	324	0.033	0.108	0.926	0.082
1	60	50	120	0.3	0.8	432	0.041	0.095	0.804	0.084
1	60	50	120	0.3	0.9	486	0.053	0.096	0.779	0.090
1	60	50	120	0.3	0.95	513	0.096	0.162	1.201	0.133
1	60	50	120	0.3	0.97	524	0.101	0.136	1.003	0.133
1	60	50	120	0.3	0.99	535	0.123	0.161	1.086	0.139
1	60	50	120	0.3	1	540	0.114	0.177	1.267	0.147
1	60	50	120	0.3	1.01	545	0.127	0.170	1.152	0.142
1	60	50	120	0.5	0.4	360	0.022	0.083	0.750	0.064
1	60	50	120	0.5	0.6	540	0.024	0.062	0.537	0.057
1	60	50	120	0.5	0.8	720	0.028	0.054	0.489	0.061
1	60	50	120	0.5	0.9	810	0.039	0.062	0.475	0.062
1	60	50	120	0.5	0.95	855	0.071	0.102	0.731	0.093
1	60	50	120	0.5	0.97	873	0.080	0.108	0.734	0.095
1	60	50	120	0.5	0.99	891	0.096	0.121	0.772	0.101
1	60	50	120	0.5	1	900	0.105	0.130	0.791	0.105
1	60	50	120	0.5	1.01	909	0.112	0.135	0.793	0.105
1	60	50	120	0.7	0.4	504	0.011	0.047	0.437	0.036
1	60	50	120	0.7	0.6	756	0.013	0.032	0.306	0.037
1	60	50	120	0.7	0.8	1008	0.016	0.030	0.288	0.040
1	60	50	120	0.7	0.9	1134	0.029	0.045	0.362	0.051
1	60	50	120	0.7	0.95	1197	0.042	0.057	0.404	0.056
1	60	50	120	0.7	0.97	1222	0.057	0.069	0.443	0.065
1	60	50	120	0.7	0.99	1247	0.059	0.078	0.465	0.062
1	60	50	120	0.7	1	1260	0.059	0.076	0.476	0.066
1	60	50	120	0.7	1.01	1273	0.060	0.072	0.427	0.063
1	60	40	60	0.3	0.4	216	0.027	0.189	1.652	0.090
1	60	40	60	0.3	0.6	324	0.027	0.124	1.101	0.083
1	60	40	60	0.3	0.8	432	0.031	0.118	1.026	0.088
1	60	40	60	0.3	0.9	486	0.041	0.128	1.083	0.102
1	60	40	60	0.3	0.95	513	0.054	0.121	1.007	0.109
1	60	40	60	0.3	0.97	524	0.073	0.151	1.169	0.122
1	60	40	60	0.3	0.99	535	0.084	0.150	1.144	0.128
1	60	40	60	0.3	1	540	0.089	0.167	1.264	0.135
1	60	40	60	0.3	1.01	545	0.095	0.168	1.238	0.141
1	60	40	60	0.5	0.4	360	0.016	0.119	1.000	0.056
1	60	40	60	0.5	0.6	540	0.019	0.078	0.705	0.061
1	60	40	60	0.5	0.8	720	0.020	0.057	0.519	0.055
1	60	40	60	0.5	0.9	810	0.024	0.064	0.552	0.060
1	60	40	60	0.5	0.95	855	0.034	0.069	0.591	0.073
1	60	40	60	0.5	0.97	873	0.042	0.092	0.750	0.081
1	60	40	60	0.5	0.99	891	0.055	0.095	0.707	0.085
1	60	40	60	0.5	1	900	0.068	0.115	0.833	0.096

A	B	C	D	E	F	G	H	I	J	K
1	60	40	60	0.5	1.01	909	0.083	0.123	0.822	0.100
1	60	40	60	0.7	0.4	504	0.008	0.060	0.538	0.033
1	60	40	60	0.7	0.6	756	0.010	0.053	0.469	0.039
1	60	40	60	0.7	0.8	1008	0.012	0.043	0.384	0.040
1	60	40	60	0.7	0.9	1134	0.017	0.048	0.422	0.047
1	60	40	60	0.7	0.95	1197	0.026	0.055	0.434	0.052
1	60	40	60	0.7	0.97	1222	0.031	0.062	0.487	0.057
1	60	40	60	0.7	0.99	1247	0.038	0.065	0.466	0.059
1	60	40	60	0.7	1	1260	0.055	0.079	0.495	0.068
1	60	40	60	0.7	1.01	1273	0.057	0.086	0.547	0.072
1	60	40	75	0.3	0.4	216	0.029	0.201	1.639	0.089
1	60	40	75	0.3	0.6	324	0.031	0.124	1.074	0.084
1	60	40	75	0.3	0.8	432	0.033	0.100	0.848	0.077
1	60	40	75	0.3	0.9	486	0.041	0.096	0.818	0.087
1	60	40	75	0.3	0.95	513	0.063	0.120	0.946	0.102
1	60	40	75	0.3	0.97	524	0.072	0.127	0.955	0.109
1	60	40	75	0.3	0.99	535	0.081	0.138	1.025	0.116
1	60	40	75	0.3	1	540	0.083	0.137	1.022	0.115
1	60	40	75	0.3	1.01	545	0.102	0.157	1.115	0.130
1	60	40	75	0.5	0.4	360	0.018	0.103	0.872	0.057
1	60	40	75	0.5	0.6	540	0.016	0.048	0.439	0.043
1	60	40	75	0.5	0.8	720	0.019	0.050	0.444	0.048
1	60	40	75	0.5	0.9	810	0.026	0.059	0.494	0.054
1	60	40	75	0.5	0.95	855	0.038	0.075	0.592	0.067
1	60	40	75	0.5	0.97	873	0.040	0.073	0.559	0.064
1	60	40	75	0.5	0.99	891	0.054	0.083	0.598	0.075
1	60	40	75	0.5	1	900	0.070	0.106	0.735	0.090
1	60	40	75	0.5	1.01	909	0.085	0.115	0.729	0.090
1	60	40	75	0.7	0.4	504	0.010	0.053	0.484	0.040
1	60	40	75	0.7	0.6	756	0.008	0.031	0.294	0.030
1	60	40	75	0.7	0.8	1008	0.013	0.036	0.312	0.037
1	60	40	75	0.7	0.9	1134	0.020	0.048	0.378	0.041
1	60	40	75	0.7	0.95	1197	0.029	0.048	0.375	0.049
1	60	40	75	0.7	0.97	1222	0.031	0.054	0.412	0.050
1	60	40	75	0.7	0.99	1247	0.046	0.066	0.425	0.056
1	60	40	75	0.7	1	1260	0.056	0.075	0.449	0.061
1	60	40	75	0.7	1.01	1273	0.059	0.076	0.423	0.059
1	60	40	90	0.3	0.4	216	0.031	0.154	1.343	0.088
1	60	40	90	0.3	0.6	324	0.029	0.096	0.827	0.070
1	60	40	90	0.3	0.8	432	0.033	0.085	0.701	0.067
1	60	40	90	0.3	0.9	486	0.036	0.073	0.587	0.067
1	60	40	90	0.3	0.95	513	0.073	0.119	0.879	0.101
1	60	40	90	0.3	0.97	524	0.071	0.119	0.836	0.094
1	60	40	90	0.3	0.99	535	0.076	0.120	0.855	0.097
1	60	40	90	0.3	1	540	0.087	0.136	0.976	0.111
1	60	40	90	0.3	1.01	545	0.104	0.148	1.004	0.120
1	60	40	90	0.5	0.4	360	0.019	0.086	0.719	0.053
1	60	40	90	0.5	0.6	540	0.017	0.056	0.486	0.045
1	60	40	90	0.5	0.8	720	0.022	0.054	0.473	0.051
1	60	40	90	0.5	0.9	810	0.027	0.053	0.430	0.052
1	60	40	90	0.5	0.95	855	0.039	0.069	0.515	0.060
1	60	40	90	0.5	0.97	873	0.040	0.070	0.517	0.059
1	60	40	90	0.5	0.99	891	0.053	0.078	0.542	0.067
1	60	40	90	0.5	1	900	0.075	0.101	0.651	0.082
1	60	40	90	0.5	1.01	909	0.083	0.110	0.678	0.081
1	60	40	90	0.7	0.4	504	0.012	0.046	0.421	0.039
1	60	40	90	0.7	0.6	756	0.011	0.037	0.331	0.033
1	60	40	90	0.7	0.8	1008	0.013	0.028	0.253	0.034
1	60	40	90	0.7	0.9	1134	0.020	0.045	0.354	0.037
1	60	40	90	0.7	0.95	1197	0.028	0.047	0.344	0.044
1	60	40	90	0.7	0.97	1222	0.030	0.047	0.354	0.045
1	60	40	90	0.7	0.99	1247	0.047	0.062	0.364	0.048
1	60	40	90	0.7	1	1260	0.058	0.075	0.439	0.059
1	60	40	90	0.7	1.01	1273	0.060	0.067	0.317	0.051
1	60	40	105	0.3	0.4	216	0.032	0.140	1.189	0.084
1	60	40	105	0.3	0.6	324	0.031	0.082	0.709	0.068
1	60	40	105	0.3	0.8	432	0.036	0.082	0.689	0.072
1	60	40	105	0.3	0.9	486	0.047	0.086	0.664	0.074

A	B	C	D	E	F	G	H	I	J	K
1	60	40	105	0.3	0.95	513	0.064	0.096	0.692	0.083
1	60	40	105	0.3	0.97	524	0.085	0.132	0.925	0.102
1	60	40	105	0.3	0.99	535	0.080	0.130	0.925	0.098
1	60	40	105	0.3	1	540	0.092	0.120	0.809	0.102
1	60	40	105	0.3	1.01	545	0.103	0.144	0.961	0.113
1	60	40	105	0.5	0.4	360	0.021	0.087	0.724	0.054
1	60	40	105	0.5	0.6	540	0.019	0.058	0.490	0.045
1	60	40	105	0.5	0.8	720	0.025	0.044	0.359	0.044
1	60	40	105	0.5	0.9	810	0.029	0.053	0.403	0.046
1	60	40	105	0.5	0.95	855	0.037	0.057	0.419	0.053
1	60	40	105	0.5	0.97	873	0.041	0.068	0.486	0.055
1	60	40	105	0.5	0.99	891	0.066	0.089	0.582	0.072
1	60	40	105	0.5	1	900	0.074	0.094	0.582	0.074
1	60	40	105	0.5	1.01	909	0.092	0.113	0.641	0.078
1	60	40	105	0.7	0.4	504	0.010	0.048	0.416	0.032
1	60	40	105	0.7	0.6	756	0.011	0.031	0.271	0.029
1	60	40	105	0.7	0.8	1008	0.013	0.025	0.207	0.027
1	60	40	105	0.7	0.9	1134	0.020	0.040	0.309	0.037
1	60	40	105	0.7	0.95	1197	0.030	0.044	0.305	0.039
1	60	40	105	0.7	0.97	1222	0.033	0.045	0.299	0.040
1	60	40	105	0.7	0.99	1247	0.048	0.062	0.368	0.049
1	60	40	105	0.7	1	1260	0.060	0.064	0.295	0.051
1	60	40	105	0.7	1.01	1273	0.060	0.064	0.275	0.046
1	60	40	120	0.3	0.4	216	0.031	0.144	1.183	0.074
1	60	40	120	0.3	0.6	324	0.031	0.089	0.742	0.066
1	60	40	120	0.3	0.8	432	0.038	0.079	0.613	0.063
1	60	40	120	0.3	0.9	486	0.045	0.069	0.529	0.063
1	60	40	120	0.3	0.95	513	0.069	0.102	0.693	0.081
1	60	40	120	0.3	0.97	524	0.085	0.118	0.799	0.095
1	60	40	120	0.3	0.99	535	0.088	0.124	0.836	0.098
1	60	40	120	0.3	1	540	0.091	0.116	0.778	0.096
1	60	40	120	0.3	1.01	545	0.103	0.136	0.886	0.106
1	60	40	120	0.5	0.4	360	0.021	0.069	0.576	0.050
1	60	40	120	0.5	0.6	540	0.023	0.053	0.432	0.044
1	60	40	120	0.5	0.8	720	0.026	0.047	0.380	0.046
1	60	40	120	0.5	0.9	810	0.031	0.045	0.314	0.041
1	60	40	120	0.5	0.95	855	0.048	0.073	0.491	0.055
1	60	40	120	0.5	0.97	873	0.059	0.077	0.504	0.063
1	60	40	120	0.5	0.99	891	0.072	0.092	0.563	0.071
1	60	40	120	0.5	1	900	0.081	0.095	0.563	0.073
1	60	40	120	0.5	1.01	909	0.101	0.118	0.650	0.079
1	60	40	120	0.7	0.4	504	0.010	0.042	0.377	0.032
1	60	40	120	0.7	0.6	756	0.011	0.020	0.191	0.028
1	60	40	120	0.7	0.8	1008	0.014	0.029	0.238	0.029
1	60	40	120	0.7	0.9	1134	0.022	0.034	0.236	0.032
1	60	40	120	0.7	0.95	1197	0.029	0.038	0.262	0.036
1	60	40	120	0.7	0.97	1222	0.037	0.050	0.312	0.040
1	60	40	120	0.7	0.99	1247	0.054	0.062	0.328	0.047
1	60	40	120	0.7	1	1260	0.061	0.066	0.285	0.046
1	60	40	120	0.7	1.01	1273	0.062	0.067	0.270	0.046
1	50	45	60	0.3	0.4	216	0.020	0.050	0.619	0.069
1	50	45	60	0.3	0.6	324	0.021	0.041	0.493	0.065
1	50	45	60	0.3	0.8	432	0.034	0.046	0.515	0.085
1	50	45	60	0.3	0.9	486	0.048	0.061	0.626	0.106
1	50	45	60	0.3	0.95	513	0.098	0.107	0.878	0.147
1	50	45	60	0.3	0.97	524	0.115	0.120	0.882	0.152
1	50	45	60	0.3	0.99	535	0.120	0.130	0.987	0.162
1	50	45	60	0.3	1	540	0.121	0.130	0.989	0.162
1	50	45	60	0.3	1.01	545	0.137	0.139	0.975	0.166
1	50	45	60	0.5	0.4	360	0.014	0.031	0.401	0.051
1	50	45	60	0.5	0.6	540	0.016	0.026	0.319	0.050
1	50	45	60	0.5	0.8	720	0.021	0.031	0.377	0.064
1	50	45	60	0.5	0.9	810	0.046	0.052	0.462	0.083
1	50	45	60	0.5	0.95	855	0.076	0.078	0.566	0.102
1	50	45	60	0.5	0.97	873	0.092	0.093	0.625	0.112
1	50	45	60	0.5	0.99	891	0.100	0.100	0.649	0.118
1	50	45	60	0.5	1	900	0.106	0.104	0.643	0.117
1	50	45	60	0.5	1.01	909	0.111	0.108	0.661	0.120

A	B	C	D	E	F	G	H	I	J	K
1	50	45	60	0.7	0.4	504	0.008	0.020	0.269	0.036
1	50	45	60	0.7	0.6	756	0.007	0.014	0.185	0.031
1	50	45	60	0.7	0.8	1008	0.014	0.020	0.242	0.043
1	50	45	60	0.7	0.9	1134	0.033	0.038	0.333	0.065
1	50	45	60	0.7	0.95	1197	0.056	0.056	0.364	0.073
1	50	45	60	0.7	0.97	1222	0.057	0.059	0.405	0.080
1	50	45	60	0.7	0.99	1247	0.057	0.058	0.389	0.076
1	50	45	60	0.7	1	1260	0.057	0.060	0.413	0.080
1	50	45	60	0.7	1.01	1273	0.058	0.059	0.384	0.077
1	50	45	75	0.3	0.4	216	0.022	0.048	0.584	0.069
1	50	45	75	0.3	0.6	324	0.025	0.039	0.446	0.067
1	50	45	75	0.3	0.8	432	0.033	0.046	0.508	0.081
1	50	45	75	0.3	0.9	486	0.050	0.061	0.594	0.099
1	50	45	75	0.3	0.95	513	0.096	0.100	0.768	0.132
1	50	45	75	0.3	0.97	524	0.111	0.116	0.855	0.142
1	50	45	75	0.3	0.99	535	0.124	0.129	0.915	0.151
1	50	45	75	0.3	1	540	0.135	0.135	0.914	0.156
1	50	45	75	0.3	1.01	545	0.137	0.137	0.924	0.154
1	50	45	75	0.5	0.4	360	0.014	0.027	0.338	0.046
1	50	45	75	0.5	0.6	540	0.016	0.024	0.282	0.044
1	50	45	75	0.5	0.8	720	0.021	0.029	0.319	0.055
1	50	45	75	0.5	0.9	810	0.044	0.047	0.386	0.069
1	50	45	75	0.5	0.95	855	0.084	0.085	0.568	0.100
1	50	45	75	0.5	0.97	873	0.097	0.094	0.565	0.102
1	50	45	75	0.5	0.99	891	0.108	0.104	0.620	0.112
1	50	45	75	0.5	1	900	0.108	0.103	0.614	0.111
1	50	45	75	0.5	1.01	909	0.115	0.110	0.626	0.113
1	50	45	75	0.7	0.4	504	0.008	0.016	0.199	0.029
1	50	45	75	0.7	0.6	756	0.009	0.016	0.211	0.032
1	50	45	75	0.7	0.8	1008	0.014	0.018	0.195	0.036
1	50	45	75	0.7	0.9	1134	0.028	0.031	0.273	0.052
1	50	45	75	0.7	0.95	1197	0.059	0.059	0.388	0.074
1	50	45	75	0.7	0.97	1222	0.058	0.058	0.377	0.073
1	50	45	75	0.7	0.99	1247	0.058	0.056	0.348	0.069
1	50	45	75	0.7	1	1260	0.058	0.058	0.375	0.074
1	50	45	75	0.7	1.01	1273	0.058	0.058	0.360	0.071
1	50	45	90	0.3	0.4	216	0.027	0.046	0.533	0.072
1	50	45	90	0.3	0.6	324	0.027	0.040	0.434	0.064
1	50	45	90	0.3	0.8	432	0.037	0.045	0.439	0.074
1	50	45	90	0.3	0.9	486	0.049	0.059	0.549	0.089
1	50	45	90	0.3	0.95	513	0.120	0.119	0.804	0.137
1	50	45	90	0.3	0.97	524	0.108	0.111	0.789	0.131
1	50	45	90	0.3	0.99	535	0.142	0.141	0.905	0.151
1	50	45	90	0.3	1	540	0.131	0.128	0.844	0.144
1	50	45	90	0.3	1.01	545	0.160	0.155	0.978	0.163
1	50	45	90	0.5	0.4	360	0.017	0.028	0.332	0.048
1	50	45	90	0.5	0.6	540	0.017	0.025	0.285	0.045
1	50	45	90	0.5	0.8	720	0.025	0.030	0.290	0.052
1	50	45	90	0.5	0.9	810	0.048	0.050	0.377	0.067
1	50	45	90	0.5	0.95	855	0.083	0.082	0.529	0.093
1	50	45	90	0.5	0.97	873	0.094	0.091	0.566	0.100
1	50	45	90	0.5	0.99	891	0.109	0.105	0.614	0.108
1	50	45	90	0.5	1	900	0.111	0.106	0.624	0.109
1	50	45	90	0.5	1.01	909	0.111	0.106	0.615	0.108
1	50	45	90	0.7	0.4	504	0.009	0.014	0.162	0.030
1	50	45	90	0.7	0.6	756	0.010	0.015	0.192	0.032
1	50	45	90	0.7	0.8	1008	0.013	0.016	0.177	0.033
1	50	45	90	0.7	0.9	1134	0.032	0.035	0.276	0.052
1	50	45	90	0.7	0.95	1197	0.057	0.056	0.346	0.066
1	50	45	90	0.7	0.97	1222	0.056	0.055	0.347	0.067
1	50	45	90	0.7	0.99	1247	0.057	0.055	0.346	0.066
1	50	45	90	0.7	1	1260	0.057	0.056	0.360	0.068
1	50	45	90	0.7	1.01	1273	0.057	0.055	0.330	0.065
1	50	45	105	0.3	0.4	216	0.029	0.049	0.563	0.078
1	50	45	105	0.3	0.6	324	0.029	0.037	0.378	0.062
1	50	45	105	0.3	0.8	432	0.041	0.047	0.417	0.070
1	50	45	105	0.3	0.9	486	0.052	0.057	0.481	0.082
1	50	45	105	0.3	0.95	513	0.114	0.112	0.750	0.127

A	B	C	D	E	F	G	H	I	J	K
1	50	45	105	0.3	0.97	524	0.121	0.119	0.773	0.131
1	50	45	105	0.3	0.99	535	0.139	0.137	0.859	0.141
1	50	45	105	0.3	1	540	0.134	0.132	0.857	0.141
1	50	45	105	0.3	1.01	545	0.153	0.147	0.905	0.150
1	50	45	105	0.5	0.4	360	0.017	0.027	0.303	0.045
1	50	45	105	0.5	0.6	540	0.019	0.025	0.269	0.043
1	50	45	105	0.5	0.8	720	0.024	0.027	0.238	0.042
1	50	45	105	0.5	0.9	810	0.051	0.053	0.402	0.070
1	50	45	105	0.5	0.95	855	0.087	0.084	0.510	0.088
1	50	45	105	0.5	0.97	873	0.100	0.096	0.574	0.099
1	50	45	105	0.5	0.99	891	0.111	0.105	0.583	0.100
1	50	45	105	0.5	1	900	0.108	0.102	0.585	0.100
1	50	45	105	0.5	1.01	909	0.110	0.105	0.590	0.100
1	50	45	105	0.7	0.4	504	0.009	0.016	0.179	0.028
1	50	45	105	0.7	0.6	756	0.009	0.014	0.155	0.027
1	50	45	105	0.7	0.8	1008	0.014	0.018	0.189	0.035
1	50	45	105	0.7	0.9	1134	0.032	0.034	0.248	0.046
1	50	45	105	0.7	0.95	1197	0.057	0.055	0.319	0.059
1	50	45	105	0.7	0.97	1222	0.055	0.053	0.316	0.060
1	50	45	105	0.7	0.99	1247	0.057	0.053	0.307	0.059
1	50	45	105	0.7	1	1260	0.056	0.055	0.329	0.061
1	50	45	105	0.7	1.01	1273	0.056	0.054	0.326	0.061
1	50	45	120	0.3	0.4	216	0.029	0.049	0.546	0.072
1	50	45	120	0.3	0.6	324	0.031	0.039	0.389	0.063
1	50	45	120	0.3	0.8	432	0.037	0.042	0.363	0.061
1	50	45	120	0.3	0.9	486	0.065	0.071	0.574	0.092
1	50	45	120	0.3	0.95	513	0.107	0.104	0.678	0.114
1	50	45	120	0.3	0.97	524	0.120	0.117	0.732	0.123
1	50	45	120	0.3	0.99	535	0.133	0.130	0.817	0.135
1	50	45	120	0.3	1	540	0.142	0.135	0.810	0.135
1	50	45	120	0.3	1.01	545	0.155	0.148	0.891	0.146
1	50	45	120	0.5	0.4	360	0.018	0.026	0.283	0.044
1	50	45	120	0.5	0.6	540	0.020	0.025	0.242	0.042
1	50	45	120	0.5	0.8	720	0.025	0.028	0.239	0.044
1	50	45	120	0.5	0.9	810	0.048	0.050	0.371	0.065
1	50	45	120	0.5	0.95	855	0.088	0.083	0.484	0.085
1	50	45	120	0.5	0.97	873	0.107	0.102	0.570	0.095
1	50	45	120	0.5	0.99	891	0.106	0.100	0.552	0.094
1	50	45	120	0.5	1	900	0.108	0.102	0.568	0.096
1	50	45	120	0.5	1.01	909	0.110	0.104	0.583	0.100
1	50	45	120	0.7	0.4	504	0.010	0.015	0.165	0.028
1	50	45	120	0.7	0.6	756	0.010	0.014	0.157	0.028
1	50	45	120	0.7	0.8	1008	0.016	0.018	0.161	0.030
1	50	45	120	0.7	0.9	1134	0.041	0.040	0.257	0.048
1	50	45	120	0.7	0.95	1197	0.057	0.053	0.282	0.053
1	50	45	120	0.7	0.97	1222	0.056	0.053	0.314	0.059
1	50	45	120	0.7	0.99	1247	0.056	0.054	0.331	0.062
1	50	45	120	0.7	1	1260	0.055	0.053	0.308	0.057
1	50	45	120	0.7	1.01	1273	0.057	0.054	0.301	0.056
1	50	40	60	0.3	0.4	216	0.020	0.047	0.583	0.065
1	50	40	60	0.3	0.6	324	0.021	0.039	0.456	0.061
1	50	40	60	0.3	0.8	432	0.030	0.043	0.464	0.075
1	50	40	60	0.3	0.9	486	0.038	0.049	0.523	0.087
1	50	40	60	0.3	0.95	513	0.077	0.084	0.692	0.118
1	50	40	60	0.3	0.97	524	0.092	0.099	0.777	0.130
1	50	40	60	0.3	0.99	535	0.095	0.101	0.779	0.131
1	50	40	60	0.3	1	540	0.097	0.103	0.796	0.134
1	50	40	60	0.3	1.01	545	0.114	0.120	0.887	0.146
1	50	40	60	0.5	0.4	360	0.014	0.029	0.367	0.047
1	50	40	60	0.5	0.6	540	0.015	0.024	0.282	0.045
1	50	40	60	0.5	0.8	720	0.019	0.028	0.316	0.055
1	50	40	60	0.5	0.9	810	0.032	0.039	0.394	0.067
1	50	40	60	0.5	0.95	855	0.046	0.049	0.417	0.075
1	50	40	60	0.5	0.97	873	0.065	0.067	0.501	0.089
1	50	40	60	0.5	0.99	891	0.079	0.080	0.559	0.098
1	50	40	60	0.5	1	900	0.095	0.094	0.594	0.106
1	50	40	60	0.5	1.01	909	0.103	0.100	0.598	0.107
1	50	40	60	0.7	0.4	504	0.007	0.017	0.237	0.033

A	B	C	D	E	F	G	H	I	J	K
1	50	40	60	0.7	0.6	756	0.007	0.012	0.160	0.026
1	50	40	60	0.7	0.8	1008	0.012	0.017	0.211	0.036
1	50	40	60	0.7	0.9	1134	0.023	0.028	0.248	0.046
1	50	40	60	0.7	0.95	1197	0.035	0.037	0.297	0.056
1	50	40	60	0.7	0.97	1222	0.046	0.048	0.341	0.066
1	50	40	60	0.7	0.99	1247	0.059	0.057	0.325	0.065
1	50	40	60	0.7	1	1260	0.058	0.058	0.366	0.069
1	50	40	60	0.7	1.01	1273	0.059	0.058	0.354	0.068
1	50	40	75	0.3	0.4	216	0.022	0.047	0.556	0.065
1	50	40	75	0.3	0.6	324	0.024	0.037	0.411	0.062
1	50	40	75	0.3	0.8	432	0.031	0.043	0.448	0.071
1	50	40	75	0.3	0.9	486	0.041	0.050	0.477	0.078
1	50	40	75	0.3	0.95	513	0.078	0.084	0.657	0.110
1	50	40	75	0.3	0.97	524	0.092	0.095	0.700	0.118
1	50	40	75	0.3	0.99	535	0.097	0.098	0.695	0.118
1	50	40	75	0.3	1	540	0.106	0.111	0.808	0.133
1	50	40	75	0.3	1.01	545	0.119	0.118	0.794	0.133
1	50	40	75	0.5	0.4	360	0.015	0.026	0.315	0.043
1	50	40	75	0.5	0.6	540	0.016	0.022	0.246	0.040
1	50	40	75	0.5	0.8	720	0.019	0.025	0.265	0.045
1	50	40	75	0.5	0.9	810	0.034	0.039	0.346	0.059
1	50	40	75	0.5	0.95	855	0.059	0.062	0.470	0.081
1	50	40	75	0.5	0.97	873	0.075	0.075	0.513	0.088
1	50	40	75	0.5	0.99	891	0.087	0.084	0.518	0.092
1	50	40	75	0.5	1	900	0.095	0.092	0.570	0.100
1	50	40	75	0.5	1.01	909	0.113	0.109	0.625	0.106
1	50	40	75	0.7	0.4	504	0.007	0.014	0.184	0.027
1	50	40	75	0.7	0.6	756	0.008	0.013	0.172	0.028
1	50	40	75	0.7	0.8	1008	0.012	0.015	0.163	0.030
1	50	40	75	0.7	0.9	1134	0.023	0.026	0.227	0.042
1	50	40	75	0.7	0.95	1197	0.044	0.044	0.294	0.056
1	50	40	75	0.7	0.97	1222	0.055	0.053	0.316	0.061
1	50	40	75	0.7	0.99	1247	0.059	0.057	0.322	0.061
1	50	40	75	0.7	1	1260	0.059	0.057	0.326	0.062
1	50	40	75	0.7	1.01	1273	0.060	0.056	0.312	0.062
1	50	40	90	0.3	0.4	216	0.027	0.044	0.501	0.067
1	50	40	90	0.3	0.6	324	0.026	0.038	0.386	0.058
1	50	40	90	0.3	0.8	432	0.035	0.042	0.397	0.067
1	50	40	90	0.3	0.9	486	0.042	0.048	0.439	0.072
1	50	40	90	0.3	0.95	513	0.097	0.097	0.660	0.109
1	50	40	90	0.3	0.97	524	0.093	0.094	0.659	0.110
1	50	40	90	0.3	0.99	535	0.117	0.116	0.750	0.123
1	50	40	90	0.3	1	540	0.107	0.108	0.728	0.119
1	50	40	90	0.3	1.01	545	0.115	0.114	0.763	0.127
1	50	40	90	0.5	0.4	360	0.017	0.027	0.311	0.045
1	50	40	90	0.5	0.6	540	0.016	0.023	0.241	0.039
1	50	40	90	0.5	0.8	720	0.022	0.026	0.251	0.046
1	50	40	90	0.5	0.9	810	0.035	0.036	0.297	0.054
1	50	40	90	0.5	0.95	855	0.053	0.054	0.382	0.065
1	50	40	90	0.5	0.97	873	0.069	0.068	0.453	0.077
1	50	40	90	0.5	0.99	891	0.093	0.089	0.528	0.090
1	50	40	90	0.5	1	900	0.103	0.098	0.543	0.093
1	50	40	90	0.5	1.01	909	0.108	0.103	0.570	0.096
1	50	40	90	0.7	0.4	504	0.008	0.013	0.155	0.028
1	50	40	90	0.7	0.6	756	0.010	0.014	0.181	0.031
1	50	40	90	0.7	0.8	1008	0.012	0.014	0.143	0.027
1	50	40	90	0.7	0.9	1134	0.024	0.027	0.240	0.043
1	50	40	90	0.7	0.95	1197	0.044	0.043	0.271	0.049
1	50	40	90	0.7	0.97	1222	0.052	0.050	0.293	0.054
1	50	40	90	0.7	0.99	1247	0.058	0.055	0.297	0.055
1	50	40	90	0.7	1	1260	0.058	0.055	0.303	0.056
1	50	40	90	0.7	1.01	1273	0.059	0.055	0.308	0.059
1	50	40	105	0.3	0.4	216	0.029	0.046	0.518	0.072
1	50	40	105	0.3	0.6	324	0.029	0.037	0.356	0.058
1	50	40	105	0.3	0.8	432	0.039	0.044	0.367	0.062
1	50	40	105	0.3	0.9	486	0.046	0.050	0.420	0.071
1	50	40	105	0.3	0.95	513	0.089	0.089	0.611	0.101
1	50	40	105	0.3	0.97	524	0.096	0.095	0.639	0.105

A	B	C	D	E	F	G	H	I	J	K
1	50	40	105	0.3	0.99	535	0.109	0.105	0.655	0.109
1	50	40	105	0.3	1	540	0.111	0.108	0.683	0.113
1	50	40	105	0.3	1.01	545	0.126	0.121	0.733	0.121
1	50	40	105	0.5	0.4	360	0.018	0.025	0.267	0.041
1	50	40	105	0.5	0.6	540	0.019	0.025	0.243	0.039
1	50	40	105	0.5	0.8	720	0.022	0.025	0.203	0.036
1	50	40	105	0.5	0.9	810	0.038	0.039	0.295	0.052
1	50	40	105	0.5	0.95	855	0.060	0.059	0.400	0.068
1	50	40	105	0.5	0.97	873	0.073	0.070	0.445	0.077
1	50	40	105	0.5	0.99	891	0.101	0.093	0.508	0.086
1	50	40	105	0.5	1	900	0.098	0.093	0.535	0.090
1	50	40	105	0.5	1.01	909	0.108	0.101	0.528	0.088
1	50	40	105	0.7	0.4	504	0.009	0.014	0.167	0.026
1	50	40	105	0.7	0.6	756	0.009	0.012	0.136	0.024
1	50	40	105	0.7	0.8	1008	0.013	0.015	0.156	0.028
1	50	40	105	0.7	0.9	1134	0.024	0.027	0.203	0.035
1	50	40	105	0.7	0.95	1197	0.047	0.045	0.265	0.049
1	50	40	105	0.7	0.97	1222	0.055	0.052	0.285	0.052
1	50	40	105	0.7	0.99	1247	0.058	0.055	0.295	0.055
1	50	40	105	0.7	1	1260	0.057	0.054	0.288	0.052
1	50	40	105	0.7	1.01	1273	0.057	0.054	0.291	0.054
1	50	40	120	0.3	0.4	216	0.029	0.047	0.502	0.065
1	50	40	120	0.3	0.6	324	0.030	0.037	0.347	0.057
1	50	40	120	0.3	0.8	432	0.034	0.039	0.328	0.054
1	50	40	120	0.3	0.9	486	0.050	0.053	0.430	0.071
1	50	40	120	0.3	0.95	513	0.085	0.086	0.592	0.095
1	50	40	120	0.3	0.97	524	0.110	0.107	0.671	0.108
1	50	40	120	0.3	0.99	535	0.113	0.108	0.653	0.107
1	50	40	120	0.3	1	540	0.122	0.117	0.703	0.114
1	50	40	120	0.3	1.01	545	0.126	0.122	0.751	0.121
1	50	40	120	0.5	0.4	360	0.018	0.025	0.261	0.040
1	50	40	120	0.5	0.6	540	0.020	0.024	0.219	0.037
1	50	40	120	0.5	0.8	720	0.024	0.026	0.215	0.039
1	50	40	120	0.5	0.9	810	0.040	0.039	0.276	0.049
1	50	40	120	0.5	0.95	855	0.063	0.060	0.378	0.066
1	50	40	120	0.5	0.97	873	0.087	0.082	0.466	0.077
1	50	40	120	0.5	0.99	891	0.091	0.085	0.469	0.078
1	50	40	120	0.5	1	900	0.102	0.094	0.494	0.084
1	50	40	120	0.5	1.01	909	0.106	0.098	0.502	0.085
1	50	40	120	0.7	0.4	504	0.010	0.014	0.156	0.026
1	50	40	120	0.7	0.6	756	0.010	0.013	0.142	0.025
1	50	40	120	0.7	0.8	1008	0.015	0.017	0.151	0.026
1	50	40	120	0.7	0.9	1134	0.028	0.028	0.189	0.037
1	50	40	120	0.7	0.95	1197	0.047	0.044	0.258	0.047
1	50	40	120	0.7	0.97	1222	0.055	0.050	0.255	0.048
1	50	40	120	0.7	0.99	1247	0.058	0.054	0.270	0.049
1	50	40	120	0.7	1	1260	0.057	0.053	0.277	0.049
1	50	40	120	0.7	1.01	1273	0.058	0.054	0.278	0.051
1	50	30	60	0.3	0.4	216	0.019	0.044	0.496	0.056
1	50	30	60	0.3	0.6	324	0.019	0.034	0.365	0.047
1	50	30	60	0.3	0.8	432	0.026	0.036	0.363	0.051
1	50	30	60	0.3	0.9	486	0.032	0.040	0.373	0.058
1	50	30	60	0.3	0.95	513	0.043	0.050	0.430	0.064
1	50	30	60	0.3	0.97	524	0.056	0.060	0.470	0.074
1	50	30	60	0.3	0.99	535	0.056	0.061	0.472	0.072
1	50	30	60	0.3	1	540	0.068	0.072	0.535	0.082
1	50	30	60	0.3	1.01	545	0.081	0.085	0.593	0.090
1	50	30	60	0.5	0.4	360	0.013	0.025	0.293	0.037
1	50	30	60	0.5	0.6	540	0.013	0.020	0.212	0.032
1	50	30	60	0.5	0.8	720	0.017	0.022	0.223	0.035
1	50	30	60	0.5	0.9	810	0.022	0.026	0.253	0.039
1	50	30	60	0.5	0.95	855	0.029	0.031	0.248	0.041
1	50	30	60	0.5	0.97	873	0.038	0.039	0.282	0.047
1	50	30	60	0.5	0.99	891	0.040	0.042	0.305	0.050
1	50	30	60	0.5	1	900	0.059	0.059	0.375	0.061
1	50	30	60	0.5	1.01	909	0.077	0.074	0.426	0.070
1	50	30	60	0.7	0.4	504	0.008	0.014	0.179	0.027
1	50	30	60	0.7	0.6	756	0.007	0.010	0.123	0.019

A	B	C	D	E	F	G	H	I	J	K
1	50	30	60	0.7	0.8	1008	0.010	0.014	0.145	0.023
1	50	30	60	0.7	0.9	1134	0.016	0.019	0.159	0.026
1	50	30	60	0.7	0.95	1197	0.020	0.021	0.168	0.028
1	50	30	60	0.7	0.97	1222	0.024	0.026	0.197	0.033
1	50	30	60	0.7	0.99	1247	0.035	0.035	0.232	0.039
1	50	30	60	0.7	1	1260	0.048	0.047	0.256	0.045
1	50	30	60	0.7	1.01	1273	0.053	0.050	0.261	0.046
1	50	30	75	0.3	0.4	216	0.020	0.041	0.441	0.053
1	50	30	75	0.3	0.6	324	0.022	0.033	0.327	0.046
1	50	30	75	0.3	0.8	432	0.028	0.033	0.295	0.047
1	50	30	75	0.3	0.9	486	0.034	0.038	0.311	0.048
1	50	30	75	0.3	0.95	513	0.051	0.054	0.400	0.062
1	50	30	75	0.3	0.97	524	0.068	0.070	0.480	0.073
1	50	30	75	0.3	0.99	535	0.062	0.065	0.461	0.071
1	50	30	75	0.3	1	540	0.071	0.073	0.504	0.077
1	50	30	75	0.3	1.01	545	0.080	0.081	0.539	0.083
1	50	30	75	0.5	0.4	360	0.013	0.023	0.254	0.033
1	50	30	75	0.5	0.6	540	0.014	0.019	0.199	0.029
1	50	30	75	0.5	0.8	720	0.018	0.023	0.212	0.032
1	50	30	75	0.5	0.9	810	0.023	0.025	0.208	0.034
1	50	30	75	0.5	0.95	855	0.036	0.037	0.271	0.043
1	50	30	75	0.5	0.97	873	0.041	0.042	0.298	0.046
1	50	30	75	0.5	0.99	891	0.057	0.056	0.342	0.055
1	50	30	75	0.5	1	900	0.056	0.056	0.339	0.055
1	50	30	75	0.5	1.01	909	0.089	0.084	0.456	0.073
1	50	30	75	0.7	0.4	504	0.008	0.012	0.146	0.023
1	50	30	75	0.7	0.6	756	0.008	0.012	0.138	0.021
1	50	30	75	0.7	0.8	1008	0.010	0.013	0.129	0.020
1	50	30	75	0.7	0.9	1134	0.016	0.019	0.157	0.025
1	50	30	75	0.7	0.95	1197	0.022	0.022	0.150	0.026
1	50	30	75	0.7	0.97	1222	0.026	0.027	0.182	0.031
1	50	30	75	0.7	0.99	1247	0.037	0.036	0.216	0.037
1	50	30	75	0.7	1	1260	0.054	0.051	0.242	0.044
1	50	30	75	0.7	1.01	1273	0.058	0.054	0.254	0.045
1	50	30	90	0.3	0.4	216	0.025	0.039	0.401	0.054
1	50	30	90	0.3	0.6	324	0.024	0.032	0.289	0.042
1	50	30	90	0.3	0.8	432	0.031	0.035	0.291	0.045
1	50	30	90	0.3	0.9	486	0.036	0.040	0.314	0.047
1	50	30	90	0.3	0.95	513	0.062	0.062	0.413	0.065
1	50	30	90	0.3	0.97	524	0.072	0.071	0.459	0.072
1	50	30	90	0.3	0.99	535	0.077	0.075	0.466	0.073
1	50	30	90	0.3	1	540	0.080	0.079	0.496	0.077
1	50	30	90	0.3	1.01	545	0.088	0.086	0.531	0.083
1	50	30	90	0.5	0.4	360	0.015	0.024	0.245	0.033
1	50	30	90	0.5	0.6	540	0.014	0.018	0.174	0.027
1	50	30	90	0.5	0.8	720	0.020	0.021	0.161	0.029
1	50	30	90	0.5	0.9	810	0.026	0.027	0.209	0.034
1	50	30	90	0.5	0.95	855	0.033	0.035	0.236	0.036
1	50	30	90	0.5	0.97	873	0.041	0.041	0.266	0.042
1	50	30	90	0.5	0.99	891	0.055	0.054	0.329	0.051
1	50	30	90	0.5	1	900	0.066	0.064	0.361	0.057
1	50	30	90	0.5	1.01	909	0.088	0.084	0.448	0.070
1	50	30	90	0.7	0.4	504	0.008	0.012	0.123	0.020
1	50	30	90	0.7	0.6	756	0.010	0.013	0.130	0.021
1	50	30	90	0.7	0.8	1008	0.011	0.013	0.106	0.017
1	50	30	90	0.7	0.9	1134	0.020	0.022	0.162	0.026
1	50	30	90	0.7	0.95	1197	0.026	0.024	0.149	0.026
1	50	30	90	0.7	0.97	1222	0.030	0.030	0.182	0.030
1	50	30	90	0.7	0.99	1247	0.041	0.039	0.203	0.035
1	50	30	90	0.7	1	1260	0.062	0.057	0.255	0.046
1	50	30	90	0.7	1.01	1273	0.064	0.059	0.255	0.045
1	50	30	105	0.3	0.4	216	0.026	0.040	0.386	0.054
1	50	30	105	0.3	0.6	324	0.027	0.033	0.275	0.042
1	50	30	105	0.3	0.8	432	0.035	0.038	0.297	0.044
1	50	30	105	0.3	0.9	486	0.038	0.041	0.293	0.046
1	50	30	105	0.3	0.95	513	0.052	0.055	0.373	0.055
1	50	30	105	0.3	0.97	524	0.070	0.069	0.434	0.066
1	50	30	105	0.3	0.99	535	0.082	0.080	0.477	0.072

A	B	C	D	E	F	G	H	I	J	K
1	50	30	105	0.3	1	540	0.076	0.075	0.461	0.070
1	50	30	105	0.3	1.01	545	0.097	0.094	0.547	0.084
1	50	30	105	0.5	0.4	360	0.016	0.023	0.215	0.030
1	50	30	105	0.5	0.6	540	0.018	0.021	0.179	0.028
1	50	30	105	0.5	0.8	720	0.022	0.022	0.148	0.025
1	50	30	105	0.5	0.9	810	0.028	0.029	0.196	0.031
1	50	30	105	0.5	0.95	855	0.037	0.037	0.232	0.037
1	50	30	105	0.5	0.97	873	0.049	0.048	0.290	0.045
1	50	30	105	0.5	0.99	891	0.062	0.059	0.317	0.050
1	50	30	105	0.5	1	900	0.064	0.061	0.323	0.053
1	50	30	105	0.5	1.01	909	0.092	0.085	0.410	0.067
1	50	30	105	0.7	0.4	504	0.009	0.012	0.127	0.020
1	50	30	105	0.7	0.6	756	0.009	0.009	0.078	0.014
1	50	30	105	0.7	0.8	1008	0.013	0.015	0.116	0.019
1	50	30	105	0.7	0.9	1134	0.019	0.019	0.123	0.020
1	50	30	105	0.7	0.95	1197	0.026	0.025	0.144	0.024
1	50	30	105	0.7	0.97	1222	0.034	0.032	0.179	0.031
1	50	30	105	0.7	0.99	1247	0.047	0.044	0.221	0.037
1	50	30	105	0.7	1	1260	0.059	0.055	0.239	0.041
1	50	30	105	0.7	1.01	1273	0.064	0.058	0.231	0.041
1	50	30	120	0.3	0.4	216	0.027	0.042	0.392	0.049
1	50	30	120	0.3	0.6	324	0.028	0.033	0.265	0.040
1	50	30	120	0.3	0.8	432	0.033	0.035	0.263	0.039
1	50	30	120	0.3	0.9	486	0.043	0.045	0.303	0.046
1	50	30	120	0.3	0.95	513	0.056	0.055	0.335	0.052
1	50	30	120	0.3	0.97	524	0.076	0.073	0.429	0.066
1	50	30	120	0.3	0.99	535	0.078	0.076	0.440	0.067
1	50	30	120	0.3	1	540	0.084	0.080	0.451	0.070
1	50	30	120	0.3	1.01	545	0.095	0.089	0.497	0.077
1	50	30	120	0.5	0.4	360	0.017	0.022	0.202	0.029
1	50	30	120	0.5	0.6	540	0.018	0.020	0.154	0.025
1	50	30	120	0.5	0.8	720	0.022	0.022	0.142	0.025
1	50	30	120	0.5	0.9	810	0.030	0.028	0.171	0.028
1	50	30	120	0.5	0.95	855	0.041	0.040	0.241	0.038
1	50	30	120	0.5	0.97	873	0.057	0.054	0.301	0.048
1	50	30	120	0.5	0.99	891	0.059	0.055	0.300	0.048
1	50	30	120	0.5	1	900	0.073	0.070	0.366	0.057
1	50	30	120	0.5	1.01	909	0.094	0.088	0.429	0.066
1	50	30	120	0.7	0.4	504	0.010	0.012	0.118	0.020
1	50	30	120	0.7	0.6	756	0.010	0.012	0.111	0.018
1	50	30	120	0.7	0.8	1008	0.015	0.016	0.113	0.019
1	50	30	120	0.7	0.9	1134	0.020	0.020	0.122	0.021
1	50	30	120	0.7	0.95	1197	0.027	0.025	0.138	0.023
1	50	30	120	0.7	0.97	1222	0.034	0.032	0.165	0.028
1	50	30	120	0.7	0.99	1247	0.053	0.048	0.217	0.037
1	50	30	120	0.7	1	1260	0.064	0.058	0.235	0.041
1	50	30	120	0.7	1.01	1273	0.064	0.057	0.214	0.038