

SEL Reference for ERS Calculation

Train details					SEL of Subsource component at 15m setback (Ref: FRA High-speed manual Table 5-2 HS EMU)										SEL at 15m setback with 200km/h		
Train	Length	Speed	Total cars	No. of power cars	Propulsion					Wheel/rail					Propulsion at 3m high from top of rail	Wheel at 0.3m high from top of rail	Total
					Height above rail	SEL(ref)	Len (power, ref)	Train Speed S(ref)	Speed Coefficient K	Height above rail	SEL(ref)	Len (train, ref)	Train Speed S(ref)	Speed Coefficient K			
	m	km/h			m	dBA	m	km/h		m	dBA	m	km/h		dBA	dBA	dBA
Short	213.5	200	8	5	3	86	22	32	1	0.3	91	193	145	20	94.6	94.2	97.4
Long	427	200	16	10	3	86	22	32	1	0.3	91	193	145	20	97.6	97.2	100.4

Remark: Len(ref) is reference length of noise subsource component.

For subsource propulsion, Len(power) is total length of power car. For subsource wheel/rail, Len(train) is total length of train.

Leq Reference for ERS Calculation

Scenario	Track	Train	Maximum hourly volume of train in ERS (V/hr)		Total 24 hr flow	Max 30 minutes volume of train in ERS (V/30min)	
			Day	Night		24hr	Day
Worst	Up	Short	13	6	140	7	3
		Long	2	0	33	1	0
		Total	15	6	173	8	3
Worst	Down	Short	12	5	140	6	3
		Long	3	0	33	2	0
		Total	15	5	173	8	3

Leq of 200km/h trains at 15m setback					
Prop at Height 3m			Wheel at Height 0.3m		
Leq, day	Leq, night	Leq, 24h	Leq, day	Leq, night	Leq, 24h
70.4	66.7	66.7	70.1	66.4	66.4
65.0	-	65.0	64.6	-	64.6
71.5	66.7	69.0	71.2	66.4	68.6
69.8	66.7	66.7	69.4	66.4	66.4
68.0	-	65.0	67.7	-	64.6
72.0	66.7	69.0	71.6	66.4	68.6

Remark 1: Up track refers to northbound while Down track refers to southbound.

Remark 2: SEL conversion to Leq: $Leq = SEL + 10 \log V - 35.6$ ref: FRA High Speed Manual Table 5-4

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	
159	32	32	5.67	829.0	3.0	868.0	48.1	42.9	45.1	-0.473	0.0	0.0	0.027	24.9	0	-99.0	-99.0	-99.0	-99.0		3.7	3.8	5.1	5.3	6.5	6.7	829.2	829.2	0.020	0.019	868.0	-0.473					
160	33	33	5.85	873.8	3.0	912.8	47.7	42.5	44.7	-0.480	0.0	0.0	0.026	25.0	0	-99.0	-99.0	-99.0	-99.0		3.6	3.8	5.0	5.1	6.3	6.5	874.0	873.9	0.019	0.018	912.8	-0.480					
161	34	34	6.03	880.6	3.0	919.6	47.5	42.3	44.5	-0.481	0.0	0.0	0.026	25.0	0	-99.0	-99.0	-99.0	-99.0		3.6	3.8	5.0	5.1	6.3	6.5	880.8	880.7	0.019	0.018	919.6	-0.481					
162	35	35	6.21	925.4	3.0	964.4	47.2	41.9	44.1	-0.488	0.0	0.0	0.025	25.1	0	-99.0	-99.0	-99.0	-99.0		3.6	3.8	4.9	5.0	6.1	6.3	925.5	925.5	0.018	0.017	964.4	-0.488					
163	36	36	6.38	932.2	3.0	971.2	46.9	41.7	43.9	-0.489	0.0	0.0	0.024	25.1	0	-99.0	-99.0	-99.0	-99.0		3.6	3.8	4.9	5.0	6.1	6.3	932.3	932.3	0.018	0.017	971.2	-0.489					
164	37	37	6.56	977.0	3.0	1016.0	46.6	41.3	43.6	-0.495	0.0	0.0	0.023	25.2	0	-99.0	-99.0	-99.0	-99.0		3.6	3.7	4.8	4.9	6.0	6.1	977.1	977.1	0.017	0.016	1016.0	-0.495					
165	38	38	6.74	983.8	3.0	1022.8	46.4	41.1	43.4	-0.495	0.0	0.0	0.023	25.2	0	-99.0	-99.0	-99.0	-99.0		3.6	3.7	4.8	4.9	6.0	6.1	983.9	983.9	0.017	0.016	1022.8	-0.495					
166	39	39	6.91	1028.6	3.0	1067.6	46.0	40.8	43.0	-0.501	0.0	0.0	0.022	25.3	0	-99.0	-99.0	-99.0	-99.0		3.5	3.7	4.7	4.8	5.8	6.0	1028.7	1028.7	0.016	0.015	1067.6	-0.501					
167																					Total	69.2	64.0	66.2	86.1												
168																						Noise Criteria	65	55	-	85											
169																						Status	>4.2	>9	-	>1.1											
170																																					
171																																					
172																																					
173																																					
174	0	0	0.00	3.4	0.3	49.7	65.9	60.7	62.9	9.329	20.0	20.0	0.627	0	1	48.4	43.2	45.4	65.7		14.3	18.6	46.7	51.0	79.1	83.3	19.7	18.5	5.704	5.336	49.7	9.329					
175	1	1	0.18	48.2	0.3	90.8	63.1	57.9	60.1	0.464	17.8	17.8	0.304	7.1	1	47.8	42.6	44.8	65.0		7.1	9.2	22.8	24.8	38.5	40.5	52.0	51.5	0.402	0.377	90.8	0.464					
176	2	2	0.35	55.0	0.3	97.3	62.6	57.4	59.6	0.301	15.9	15.9	0.282	8.5	1	49.2	44.0	46.2	66.4		6.6	8.5	21.2	23.1	35.7	37.6	58.3	57.9	0.353	0.331	97.3	0.301					
177	3	3	0.53	99.8	0.3	141.0	60.8	55.6	57.8	0.002	0.9	0.9	0.191	14.4	1	62.5	57.2	59.5	79.4		4.6	5.9	14.4	15.7	24.2	25.5	101.7	101.5	0.194	0.182	141.0	0.002					
178	4	4	0.71	106.6	0.3	147.7	60.5	55.2	57.4	0.000	0.0	0.0	0.182	15.0	1	62.9	57.7	59.9	79.8		4.4	5.6	13.7	15.0	23.1	24.4	108.4	108.2	0.182	0.171	147.7	0.000					
179	5	5	0.89	151.4	0.3	191.9	59.1	53.9	56.1	-0.042	0.0	0.0	0.139	17.7	1	61.6	56.4	58.6	78.3		3.4	4.4	10.6	11.5	17.7	18.7	152.6	152.5	0.128	0.120	191.9	-0.042					
180	6	6	1.06	158.2	0.3	198.7	58.8	53.6	55.8	-0.051	0.0	0.0	0.134	18.1	1	61.3	56.1	58.3	77.9		3.3	4.2	10.2	11.1	17.1	18.1	159.4	159.3	0.123	0.115	198.7	-0.051					
181	7	7	1.24	203.0	0.3	243.1	57.8	52.5	54.8	-0.115	0.0	0.0	0.109	19.7	1	60.3	55.0	57.3	76.5		2.8	3.5	8.4	9.1	14.0	14.8	203.9	203.8	0.096	0.090	243.1	-0.115					
182	8	8	1.42	209.8	0.3	249.9	57.5	52.2	54.5	-0.125	0.0	0.0	0.106	19.8	0	-99.0	-99.0	-99.0	-99.0		2.7	3.4	8.2	8.9	13.6	14.4	210.7	210.6	0.092	0.087	249.9	-0.125					
183	9	9	1.60	254.6	0.3	294.5	56.6	51.3	53.6	-0.180	0.0	0.0	0.090	20.9	0	-99.0	-99.0	-99.0	-99.0		2.3	2.9	7.0	7.6	11.6	12.2	255.3	255.3	0.076	0.071	294.5	-0.180					
184	10	10	1.77	261.4	0.3	301.3	56.3	51.1	53.3	-0.188	0.0	0.0	0.088	21.0	0	-99.0	-99.0	-99.0	-99.0		2.3	2.9	6.8	7.4	11.4	11.9	262.1	262.0	0.074	0.070	301.3	-0.188					
185	11	11	1.95	306.2	0.3	345.9	55.5	50.3	52.5	-0.233	0.0	0.0	0.077	21.8	0	-99.0	-99.0	-99.0	-99.0		2.0	2.5	6.0	6.5	9.9	10.4	306.8	306.8	0.063	0.059	345.9	-0.233					
186	12	12	2.13	313.0	0.3	352.7	55.3	50.0	52.3	-0.239	0.0	0.0	0.075	21.9	0	-99.0	-99.0	-99.0	-99.0		2.0	2.5	5.9	6.4	9.7	10.2	313.6	313.5	0.062	0.058	352.7	-0.239					
187	13	13	2.30	357.8	0.3	397.4	54.6	49.3	51.6	-0.276	0.0	0.0	0.067	22.4	0	-99.0	-99.0	-99.0	-99.0		1.8	2.2	5.2	5.7	8.7	9.1	358.3	358.3	0.054	0.051	397.4	-0.276					
188	14	14	2.48	364.6	0.3	404.2	54.3	49.1	51.3	-0.281	0.0	0.0	0.065	22.5	0	-99.0	-99.0	-99.0	-99.0		1.8	2.2	5.1	5.6	8.5	9.0	365.1	365.1	0.053	0.050	404.2	-0.281					
189	15	15	2.66	409.4	0.3	448.9	53.7	48.5	50.7	-0.310	0.0	0.0	0.059	22.9	0	-99.0	-99.0	-99.0	-99.0		1.6	2.0	4.7	5.1	7.7	8.1	409.9	409.8	0.047	0.044	448.9	-0.310					
190	16	16	2.84	416.2	0.3	455.7	53.4	48.2	50.4	-0.315	0.0	0.0	0.058	23.0	0	-99.0	-99.0	-99.0	-99.0		1.6	2.0	4.6	5.0	7.6	8.0	416.7	416.6	0.047	0.044	455.7	-0.315					
191	17	17	3.01	461.0	0.3	500.4	52.9	47.6	49.8	-0.339	0.0	0.0	0.053	23.3	0	-99.0	-99.0	-99.0	-99.0		1.5	1.8	4.2	4.6	6.9	7.3	461.4	461.4	0.042	0.039	500.4	-0.339					
192	18	18	3.19	467.8	0.3	507.2	52.6	47.4	49.6	-0.343	0.0	0.0	0.052	23.3	0	-99.0	-99.0	-99.0	-99.0		1.5	1.8	4.2	4.5	6.9	7.2	468.2	468.2	0.041	0.039	507.2	-0.343					
193	19	19	3.37	512.6	0.3	551.9	52.1	46.8	49.1	-0.363	0.0	0.0	0.048	23.6	0	-99.0	-99.0	-99.0	-99.0		1.4	1.7	3.8	4.2	6.3	6.6	513.0	512.9	0.038	0.035	551.9	-0.363					
194	20	20	3.55	519.4	0.3	558.7	51.8	46.6	48.8	-0.366	0.0	0.0	0.047	23.6	0	-99.0	-99.0	-99.0	-99.0		1.4	1.7	3.8	4.1	6.2	6.6	519.8	519.7	0.037	0.035	558.7	-0.366					
195	21	21	3.72	564.2	0.3	603.5	51.3	46.1	48.3	-0.384	0.0	0.0	0.044	23.9	0	-99.0	-99.0	-99.0	-99.0		1.3	1.6	3.5	3.8	5.8	6.1	564.5	564.5	0.034	0.032	603.5	-0.384					
196	22	22	3.90	571.0	0.3	610.3	51.1	45.9	48.1	-0.386	0.0	0.0	0.043	23.9	0	-99.0	-99.0	-99.0	-99.0		1.3	1.6	3.5	3.8	5.7	6.0	571.3	571.3	0.034	0.032	610.3	-0.386					
197	23	23	4.08	615.8	0.3	655.0	50.6	45.4	47.6	-0.401	0.0	0.0	0.040	24.1	0	-99.0	-99.0	-99.0	-99.0		1.2	1.5	3.3	3.6	5.4	5.6	616.1	616.1	0.031	0.030	655.0	-0.401					
198	24	24	4.25	622.6	0.3	661.8	50.4	45.2	47.4	-0.403	0.0	0.0	0.040	24.1	0	-99.0	-99.0	-99.0	-99.0		1.2	1.5	3.3	3.5	5.3	5.6	622.9	622.9	0.031	0.029	661.8	-0.403					
199	25	25	4.43	667.4	0.3	706.6	49.9	44.7	46.9	-0.417	0.0	0.0	0.037	24.3	0	-99.0	-99.0	-99.0	-99.0		1.1	1.4	3.1	3.3	5.0	5.3	667.7	667.7	0.029	0.027	706.6	-0.417					
200	26	26	4.61	674.2	0.3	713.4	49.7	44.5	46.7	-0.418	0.0	0.0	0.037	24.3	0	-99.0	-99.0	-99.0	-99.0		1.1	1.4	3.0	3.3	5.0	5.2	674.5	674.5	0.029	0.027	713.4	-0.418					
201	27	27	4.79	719.0	0.3	758.2	49.3	44.0	46.3	-0.430	0.0	0.0	0.035	24.5	0	-99.0	-99.0	-99.0	-99.0		1.1	1.3	2.9	3.1	4.7	4.9	719.3	719.2	0.027	0.025	758.2	-0.430					
202	28	28	4.96	725.8	0.3	765.0	49.1	43.8	46.1	-0.432	0.0	0.0	0.035	24.5	0	-99.0	-99.0	-99.0	-99.0		1.1	1.3	2.9	3.1													

SEL Reference for SSS Calculation

SSS Event	Assumed Speed	100m setback	15m setback	15m setback
		WR train length = 200m	XRL short train length = 213.5m	XRL long train length = 427m
		SEL(ref)	SEL(ref)	SEL(ref)
	km/h	dBA	dBA	dBA
Launching / Arriving	25	68	76.5	79.5

Remark: SEL of Launching/Arriving are at low speed for short train. Data collected by MTRC West Rail Pat Heung noise measurement.

SSS Event	Train Type	Train Length	Maximum hourly volume of train in SSS (V/hr)			Max 30 minutes volume of train in SSS (V/30min)		
			Day	Night	24hr	Day	Night	24hr
Launching / Arriving	Short Train	213.5	1	3	1	1	2	1
	Long Train	427	6	1	2	3	1	1

SSS Calculation at NSR SS5

NSR	No. of Storey	Ground Level mPD	Hr	ASR	Result:	Leq, day	Leq, night	Leq, 24hr	Lmax
SS5	3	17.3	7.5	B	Launching / Arriving	47.5	45.1	44.1	49.5
					Noise criteria	65	55		85
					Status	OK	OK		OK

Launching / Arriving DAY Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).

Segment	Hor D m	Angle Deg	SEL 15m	SEL NSR	Leq NSR	Shield	Track Level mPD	Hb m	Dsb m	Dbr m	Hs m	D m	P m	A barrier	IL barrier	Wheel Squeal dB	At NSR, incl façade		Shadow zone?
																	Leq, day	Lmax NSR	
Track 1 Long Train	1	146	29.2	79.5	61.7	29.2	-	15	146			146.3	9.5	0.0	0.0	0	32.2	46.5	-
	2	146	58.4	79.5	64.8	32.2	-	15	146			146.3	9.5	0.0	0.0	0	35.2	49.5	-
	3	146	44.9	79.5	63.6	31.0	-	15	146			146.3	9.5	0.0	0.0	6	40.0	48.4	-
	4	119	9.3	79.5	57.7	25.1	-	15	119			119.4	9.4	0.0	0.0	6	34.1	42.6	-
Track 1 Short Train	1	146	29.2	76.5	58.7	26.2	-	15	146			146.3	9.5	0.0	0.0	0	29.2	43.5	-
	2	146	58.4	76.5	61.8	29.2	-	15	146			146.3	9.5	0.0	0.0	0	32.2	46.5	-
	3	146	44.9	76.5	60.6	28.0	-	15	146			146.3	9.5	0.0	0.0	6	37.0	45.4	-
	4	119	9.3	76.5	54.7	22.1	-	15	119			119.4	9.4	0.0	0.0	6	31.1	39.6	-
Track 2 Long Train	1	161	27.3	79.5	61.0	28.4	-	15	161			161.3	9.5	0.0	0.0	0	31.4	45.7	-
	2	161	58.4	79.5	64.3	31.7	-	15	161			161.3	9.5	0.0	0.0	0	34.7	49.0	-
	3	161	44.9	79.5	63.2	30.6	-	15	161			161.3	9.5	0.0	0.0	6	39.6	47.8	-
	4	119	9.3	79.5	57.7	25.1	-	15	119			119.4	9.4	0.0	0.0	6	34.1	42.6	-
Track 3 Long Train	1	182	23.1	79.5	59.8	27.2	-	15	182			182.3	9.5	0.0	0.0	0	30.2	44.3	-
	2	182	58.4	79.5	63.8	31.2	-	15	182			182.3	9.5	0.0	0.0	0	34.2	48.3	-
	3	182	44.9	79.5	62.7	30.1	-	15	182			182.3	9.5	0.0	0.0	6	39.1	47.2	-
	4	123	9.3	79.5	57.5	24.9	-	15	123			123.4	9.4	0.0	0.0	6	33.9	42.4	-

Remark: For legend of parameters and remark for equations, please refers to the bottom of spreadsheet "SS2".

At NSR, incl façade		Daytime		Noise criteria		Leq, day		Status		Lmax	
Total		ASR		Leq, day		Status		Lmax		NSR	
47.5		B		65		OK		49.5			

Launching / Arriving NIGHT Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).

Segment	Hor D m	Angle Deg	SEL 15m	SEL NSR	Leq NSR	Shield	Track Level mPD	Hb m	Dsb m	Dbr m	Hs m	D m	P m	A barrier	IL barrier	Wheel Squeal dB	At NSR, incl façade		Shadow zone?
																	Leq, night	Lmax NSR	
Track 1 Long Train	1	146	29.2	79.5	61.7	29.2	-	15	146			146.3	9.5	0.0	0.0	0	32.2	46.5	-
	2	146	58.4	79.5	64.8	32.2	-	15	146			146.3	9.5	0.0	0.0	0	35.2	49.5	-
	3	146	44.9	79.5	63.6	31.0	-	15	146			146.3	9.5	0.0	0.0	6	40.0	48.4	-
	4	119	9.3	79.5	57.7	25.1	-	15	119			119.4	9.4	0.0	0.0	6	34.1	42.6	-
Track 2 Short Train	1	161	27.3	76.5	58.0	25.4	-	15	161			161.3	9.5	0.0	0.0	0	28.4	42.7	-
	2	161	58.4	76.5	61.3	28.7	-	15	161			161.3	9.5	0.0	0.0	0	31.7	46.0	-
	3	161	44.9	76.5	60.2	27.6	-	15	161			161.3	9.5	0.0	0.0	6	36.6	44.8	-
	4	119	9.3	76.5	54.7	22.1	-	15	119			119.4	9.4	0.0	0.0	6	31.1	39.6	-
Track 3 Short Train	1	182	23.1	76.5	56.8	24.2	-	15	182			182.3	9.5	0.0	0.0	0	27.2	41.3	-
	2	182	58.4	76.5	60.8	28.2	-	15	182			182.3	9.5	0.0	0.0	0	31.2	45.3	-
	3	182	44.9	76.5	59.7	27.1	-	15	182			182.3	9.5	0.0	0.0	6	36.1	44.2	-
	4	123	9.3	76.5	54.5	21.9	-	15	123			123.4	9.4	0.0	0.0	6	30.9	39.4	-

At NSR, incl façade		Daytime		Noise criteria		Leq, night		Status		Lmax	
Total		ASR		Leq, night		Status		Lmax		NSR	
45.1		B		55		OK		49.5			

Launching / Arriving 24hr Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).

Segment	Hor D m	Angle Deg	SEL 15m	SEL NSR	Leq NSR	Shield	Track Level mPD	Hb m	Dsb m	Dbr m	Hs m	D m	P m	A barrier	IL barrier	Wheel Squeal dB	At NSR, incl façade		Shadow zone?
																	Leq, 24hr	Lmax NSR	
Track 1 Long Train	1	146	29.2	79.5	61.7	29.2	-	15	146			146.3	9.5	0.0	0.0	0	32.2	46.5	-
	2	146	58.4	79.5	64.8	32.2	-	15	146			146.3	9.5	0.0	0.0	0	35.2	49.5	-
	3	146	44.9	79.5	63.6	31.0	-	15	146			146.3	9.5	0.0	0.0	6	40.0	48.4	-
	4	119	9.3	79.5	57.7	25.1	-	15	119			119.4	9.4	0.0	0.0	6	34.1	42.6	-
Track 2 Short Train	1	161	27.3	76.5	58.0	25.4	-	15	161			161.3	9.5	0.0	0.0	0	28.4	42.7	-
	2	161	58.4	76.5	61.3	28.7	-	15	161			161.3	9.5	0.0	0.0	0	31.7	46.0	-
	3	161	44.9	76.5	60.2	27.6	-	15	161			161.3	9.5	0.0	0.0	6	36.6	44.8	-
	4	119	9.3	76.5	54.7	22.1	-	15	119			119.4	9.4	0.0	0.0	6	31.1	39.6	-

At NSR, incl façade		24hr		Leq		Lmax	
Total				44.1		49.5	

Legend:	Remark for Equations:
Hr: Height of highest floor at receiver	(1): plus 3dB is to adjust SEL from short train to long train.
Hor D: Horizontal distance	(2): distance attenuation and angle of view adjustment.
Angle: Angle of View	(3): SEL conversion to Leq; Leq = SEL + 10 log V -35.6 ref: FTA Guidance Manual Table 5-2 Rail vehicle ;
Hb: Height of barrier or shield	plus 10log(2) is to convert Leq(30min) to Leq(1hr).
Dsb: Horizontal distance from noise source to barrier	(4): Barrier effect, ref: FTA Guidance Manual, Table 6-9.
Dbr: Horizontal distance from barrier to receiver	(5): Ref: Transportation Noise Reference Book equation 15.21
Hs: Height of noise source	(6): To check whether the direct path ray is under shadow zone of shielding.
D: Direct path	(7): Wheel Squeal is added to the required segments, such as turnout and curve.
P: Path difference=Shielded path - D	
A barrier: Barrier attenuation (dB)	
IL barrier: Barrier loss (dB)	

SSS Calculation at NSR SS14																					
NSR	No. of Storey	Ground Level mPD	Hr	ASR	Result:					Leq, day	Leq, night	Leq, 24hr	Lmax								
SS14	3	17	7.5	B	Launching / Arriving					46.8	44.5	43.4	53.3								
					Noise criteria					65	55		85								
					Status					OK	OK		OK								
Launching / Arriving DAY Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).																					
															At NSR, incl façade						
															for 30min	At NSR, no shield					
Segment	Hor D	Angle	SEL	SEL	Leq	Shield	Track Level	Hb	Dsb	Dbr	Hs	D	P	A barrier	IL barrier	Wheel Squeal	Leq, day	Lmax	Shadow zone?		
	m	Deg	15m	NSR	NSR		mPD	m	m	m	m	m	m			dB	NSR	NSR			
Track 1 Long Train	1	92	63.8	79.5	67.1	34.6	-	15	92			92.5	9.0	0.0	0.0	0	37.6	52.2	-		
	2	92	82.1	79.5	68.2	35.6	-	15	92			92.5	9.0	0.0	0.0	0	38.6	53.3	-		
	3	170	10.3	79.5	56.6	24.0	-	15	170			170.3	9.2	0.0	0.0	6	33.0	41.2	-		
Track 1 Short Train	1	92	63.8	76.5	64.1	31.6	-	15	92			92.5	9.0	0.0	0.0	0	34.6	49.2	-		
	2	92	82.1	76.5	65.2	32.6	-	15	92			92.5	9.0	0.0	0.0	0	35.6	50.3	-		
	3	170	10.3	76.5	53.6	21.0	-	15	170			170.3	9.2	0.0	0.0	6	30.0	38.2	-		
Track 2 Long Train	1	107	61.4	79.5	66.3	33.7	-	15	107			107.4	9.1	0.0	0.0	0	36.7	51.3	-		
	2	107	75.4	79.5	67.2	34.6	-	15	107			107.4	9.1	0.0	0.0	0	37.6	52.2	-		
	3	170	17.1	79.5	58.8	26.2	-	15	170			170.3	9.2	0.0	0.0	6	35.2	43.4	-		
Track 3 Long Train	1	128	56.2	79.5	65.2	32.6	-	15	128			128.4	9.1	0.0	0.0	0	35.6	50.0	-		
	2	128	69	79.5	66.0	33.5	-	15	128			128.4	9.1	0.0	0.0	0	36.5	50.9	-		
	3	196	23.4	79.5	59.5	26.9	-	15	196			196.2	9.3	0.0	0.0	6	35.9	43.9	-		
Remark: For legend of parameters and remark for equations, please refers to the bottom of spreadsheet "SS2".																					
At NSR, incl façade																					
Daytime																					
Noise criteria																					
Leq, day																					
Status																					
Lmax																					
NSR																					
46.8																					
B																					
65																					
OK																					
53.3																					
Launching / Arriving NIGHT Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).																					
															At NSR, incl façade						
															for 30min	At NSR, no shield					
Segment	Hor D	Angle	SEL	SEL	Leq	Shield	Track Level	Hb	Dsb	Dbr	Hs	D	P	A barrier	IL barrier	Wheel Squeal	Leq, night	Lmax	Shadow zone?		
	m	Deg	15m	NSR	NSR		mPD	m	m	m	m	m	m			dB	NSR	NSR			
Track 1 Long Train	1	92	63.8	79.5	67.1	34.6	-	15	92			92.5	9.0	0.0	0.0	0	37.6	52.2	-		
	2	92	82.1	79.5	68.2	35.6	-	15	92			92.5	9.0	0.0	0.0	0	38.6	53.3	-		
	3	170	10.3	79.5	56.6	24.0	-	15	170			170.3	9.2	0.0	0.0	6	33.0	41.2	-		
Track 2 Short Train	1	107	61.4	76.5	63.3	30.7	-	15	107			107.4	9.1	0.0	0.0	0	33.7	48.3	-		
	2	107	75.4	76.5	64.2	31.6	-	15	107			107.4	9.1	0.0	0.0	0	34.6	49.2	-		
	3	170	17.1	76.5	55.8	23.2	-	15	170			170.3	9.2	0.0	0.0	6	32.2	40.4	-		
Track 3 Short Train	1	128	56.2	76.5	62.2	29.6	-	15	128			128.4	9.1	0.0	0.0	0	32.6	47.0	-		
	2	128	69	76.5	63.0	30.5	-	15	128			128.4	9.1	0.0	0.0	0	33.5	47.9	-		
	3	196	23.4	76.5	56.5	23.9	-	15	196			196.2	9.3	0.0	0.0	6	32.9	40.9	-		
At NSR, incl façade																					
Daytime																					
Noise criteria																					
Leq, night																					
Status																					
Lmax																					
NSR																					
44.5																					
B																					
55																					
OK																					
53.3																					
Launching / Arriving 24hr Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).																					
															At NSR, incl façade						
															for 30min	At NSR, no shield					
Segment	Hor D	Angle	SEL	SEL	Leq	Shield	Track Level	Hb	Dsb	Dbr	Hs	D	P	A barrier	IL barrier	Wheel Squeal	Leq, 24hr	Lmax	Shadow zone?		
	m	Deg	15m	NSR	NSR		mPD	m	m	m	m	m	m			dB	NSR	NSR			
Track 1 Long Train	1	92	63.8	79.5	67.1	34.6	-	15	92			92.5	9.0	0.0	0.0	0	37.6	52.2	-		
	2	92	82.1	79.5	68.2	35.6	-	15	92			92.5	9.0	0.0	0.0	0	38.6	53.3	-		
	3	170	10.3	79.5	56.6	24.0	-	15	170			170.3	9.2	0.0	0.0	6	33.0	41.2	-		
Track 2 Short Train	1	107	61.4	76.5	63.3	30.7	-	15	107			107.4	9.1	0.0	0.0	0	33.7	48.3	-		
	2	107	75.4	76.5	64.2	31.6	-	15	107			107.4	9.1	0.0	0.0	0	34.6	49.2	-		
	3	170	17.1	76.5	55.8	23.2	-	15	170			170.3	9.2	0.0	0.0	6	32.2	40.4	-		
At NSR, incl façade																					
24hr																					
Leq																					
Lmax																					
NSR																					
43.4																					
53.3																					
Legend:																					
Hr: Height of highest floor at receiver										Remark for Equations:											
Hor D: Horizontal distance										(1): plus 3dB is to adjust SEL from short train to long train.											
Angle: Angle of View										(2): distance attenuation and angle of view adjustment.											
Hb: Height of barrier or shield										(3): SEL conversion to Leq: Leq = SEL + 10 log V -35.6 ref: FTA Guidance Manual Table 5-2 Rail vehicle ;											
Dsb: Horizontal distance from noise source to barrier										plus 10log(2) is to convert Leq(30min) to Leq(1hr).											
Dbr: Horizontal distance from barrier to receiver										(4): Barrier effect, ref: FTA Guidance Manual, Table 6-9.											
Hs: Height of noise source										(5): Ref: Transportation Noise Reference Book equation 15.21											
D: Direct path										(6): To check whether the direct path ray is under shadow zone of shielding.											
P: Path difference=Shielded path - D										(7): Wheel Squeal is added to the required segments, such as turnout and curve.											
A barrier: Barrier attenuation (dB)																					
IL barrier: Barrier loss (dB)																					

SSS Calculation at NSR SS15																						
NSR	No. of Storey	Ground Level mPD	Hr m	ASR	Result:					Leq, day	Leq, night	Leq, 24hr	Lmax									
SS15	3	15.7	7.5	B	Launching / Arriving					47.3	44.9	43.9	55.6									
									Noise criteria	65	55	85										
									Status	OK	OK	OK										
Launching / Arriving DAY																						
Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).																						
																	At NSR, incl façade					
																	for 30min	At NSR, no shield				
Segment	Hor D m	Angle Deg	SEL 15m	SEL NSR	Leq NSR	Shield	Track Level mPD	Hb m	Dsb m	Dbr m	Hs m	D m	P m	A barrier	IL barrier	Wheel Squeal dB	Leq, day	Lmax NSR	Shadow zone?			
Track 1 Long Train	1	78	117.7	79.5	70.5	37.9	-	15	78			78.4	7.8	0.0	0.0	0	40.9	55.6	-			
	2	78	23.8	79.5	63.6	31.0	-	15	78			78.4	7.8	0.0	0.0	0	34.0	48.6	-			
	3	158	8.9	79.5	56.2	23.6	-	15	158			158.2	8.0	0.0	0.0	6	32.6	40.9	-			
Track 1 Short Train	1	78	117.7	76.5	67.5	34.9	-	15	78			78.4	7.8	0.0	0.0	0	37.9	52.6	-			
	2	78	23.8	76.5	60.6	28.0	-	15	78			78.4	7.8	0.0	0.0	0	31.0	45.6	-			
	3	158	8.9	76.5	53.2	20.6	-	15	158			158.2	8.0	0.0	0.0	6	29.6	37.9	-			
Track 2 Long Train	1	93	115	79.5	69.7	37.1	-	15	93			93.4	7.8	0.0	0.0	0	40.1	54.7	-			
	2	93	26.8	79.5	63.3	30.7	-	15	93			93.4	7.8	0.0	0.0	0	33.7	48.3	-			
	3	158	15	79.5	58.5	25.9	-	15	158			158.2	8.0	0.0	0.0	6	34.9	43.2	-			
Track 3 Long Train	1	113	109.4	79.5	68.6	36.0	-	15	113			113.3	7.9	0.0	0.0	0	39.0	53.5	-			
	2	113	22.5	79.5	61.7	29.1	-	15	113			113.3	7.9	0.0	0.0	0	32.1	46.7	-			
	3	195	19.2	79.5	58.7	26.1	-	15	195			195.2	8.0	0.0	0.0	6	35.1	43.1	-			
Remark: For legend of parameters and remark for equations, please refers to the bottom of spreadsheet "SS2".																						
At NSR, incl façade																						
Daytime																						
Noise criteria																						
Leq ASR Leq, day Status Lmax																						
Total 47.3 B 65 OK 55.6																						
Launching / Arriving NIGHT																						
Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).																						
																	At NSR, incl façade					
																	for 30min	At NSR, no shield				
Segment	Hor D m	Angle Deg	SEL 15m	SEL NSR	Leq NSR	Shield	Track Level mPD	Hb m	Dsb m	Dbr m	Hs m	D m	P m	A barrier	IL barrier	Wheel Squeal dB	Leq, night	Lmax NSR	Shadow zone?			
Track 1 Long Train	1	78	117.7	79.5	70.5	37.9	-	15	78			78.4	7.8	0.0	0.0	0	40.9	55.6	-			
	2	78	23.8	79.5	63.6	31.0	-	15	78			78.4	7.8	0.0	0.0	0	34.0	48.6	-			
	3	158	8.9	79.5	56.2	23.6	-	15	158			158.2	8.0	0.0	0.0	6	32.6	40.9	-			
Track 2 Short Train	1	93	115	76.5	66.7	34.1	-	15	93			93.4	7.8	0.0	0.0	0	37.1	51.7	-			
	2	93	26.8	76.5	60.3	27.7	-	15	93			93.4	7.8	0.0	0.0	0	30.7	45.3	-			
	3	158	15	76.5	55.5	22.9	-	15	158			158.2	8.0	0.0	0.0	6	31.9	40.2	-			
Track 3 Short Train	1	113	109.4	76.5	65.6	33.0	-	15	113			113.3	7.9	0.0	0.0	0	36.0	50.5	-			
	2	113	22.5	76.5	58.7	26.1	-	15	113			113.3	7.9	0.0	0.0	0	29.1	43.7	-			
	3	195	19.2	76.5	55.7	23.1	-	15	195			195.2	8.0	0.0	0.0	6	32.1	40.1	-			
At NSR, incl façade																						
Daytime																						
Noise criteria																						
Leq ASR Leq, night Status Lmax																						
Total 44.9 B 55 OK 55.6																						
Launching / Arriving 24hr																						
Remark: plus 10log(2) is for converting of Leq(30min) to Leq(1hr).																						
																	At NSR, incl façade					
																	for 30min	At NSR, no shield				
Segment	Hor D m	Angle Deg	SEL 15m	SEL NSR	Leq NSR	Shield	Track Level mPD	Hb m	Dsb m	Dbr m	Hs m	D m	P m	A barrier	IL barrier	Wheel Squeal dB	Leq, 24hr	Lmax NSR	Shadow zone?			
Track 1 Long Train	1	78	117.7	79.5	70.5	37.9	-	15	78			78.4	7.8	0.0	0.0	0	40.9	55.6	-			
	2	78	23.8	79.5	63.6	31.0	-	15	78			78.4	7.8	0.0	0.0	0	34.0	48.6	-			
	3	158	8.9	79.5	56.2	23.6	-	15	158			158.2	8.0	0.0	0.0	6	32.6	40.9	-			
Track 2 Short Train	1	93	115	76.5	66.7	34.1	-	15	93			93.4	7.8	0.0	0.0	0	37.1	51.7	-			
	2	93	26.8	76.5	60.3	27.7	-	15	93			93.4	7.8	0.0	0.0	0	30.7	45.3	-			
	3	158	15	76.5	55.5	22.9	-	15	158			158.2	8.0	0.0	0.0	6	31.9	40.2	-			
At NSR, incl façade																						
24hr																						
Leq Lmax																						
Total 43.9 55.6																						
Legend:																						
Hr: Height of highest floor at receiver										Remark for Equations:												
Hor D: Horizontal distance										(1): plus 3dB is to adjust SEL from short train to long train.												
Angle: Angle of View										(2): distance attenuation and angle of view adjustment.												
Hb: Height of barrier or shield										(3): SEL conversion to Leq: $Leq = SEL + 10 \log V - 35.6$ ref: FTA Guidance Manual Table 5-2 Rail vehicle ;												
Dsb: Horizontal distance from noise source to barrier										plus 10log(2) is to convert Leq(30min) to Leq(1hr).												
Dbr: Horizontal distance from barrier to receiver										(4): Barrier effect, ref: FTA Guidance Manual, Table 6-9.												
Hs: Height of noise source										(5): Ref: Transportation Noise Reference Book equation 15.21												
D: Direct path										(6): To check whether the direct path ray is under shadow zone of shielding.												
P: Path difference=Shielded path - D										(7): Wheel Squeal is added to the required segments, such as turnout and curve.												
A barrier: Barrier attenuation (dB)																						
IL barrier: Barrier loss (dB)																						