



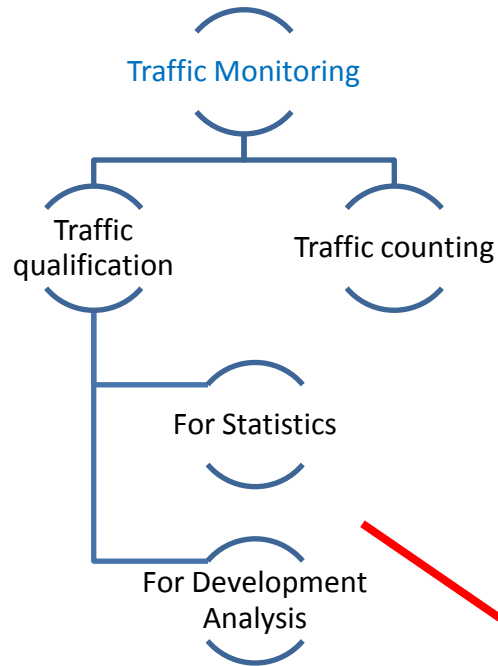
# HS WIM direct enforcement

Emil Doupal

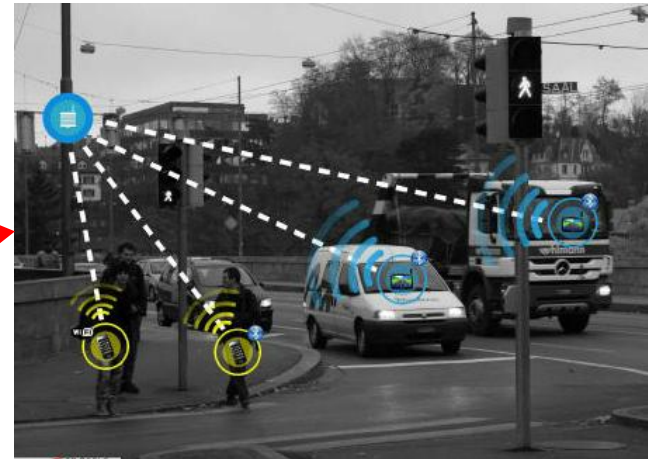
RTS GmbH, Zürich

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# Traffic Monitoring



## Radar Traffic Monitoring



Workshop Weigh-In-Motion for enforcement, Amsterdam 2014

## WIM Monitoring



Quartz WIM Sensor type Lineas®

# Weight Enforcement

Road Management and Weight Enforcement

Direct tolling

Selective on over weight vehicles

Mobile

Stationary

Pre-selection



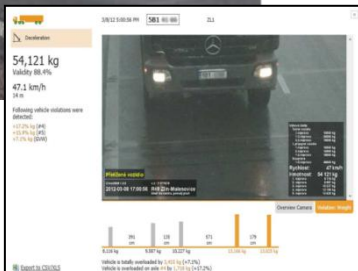
Quartz WIM Sensor type Lineas®



Portable scale

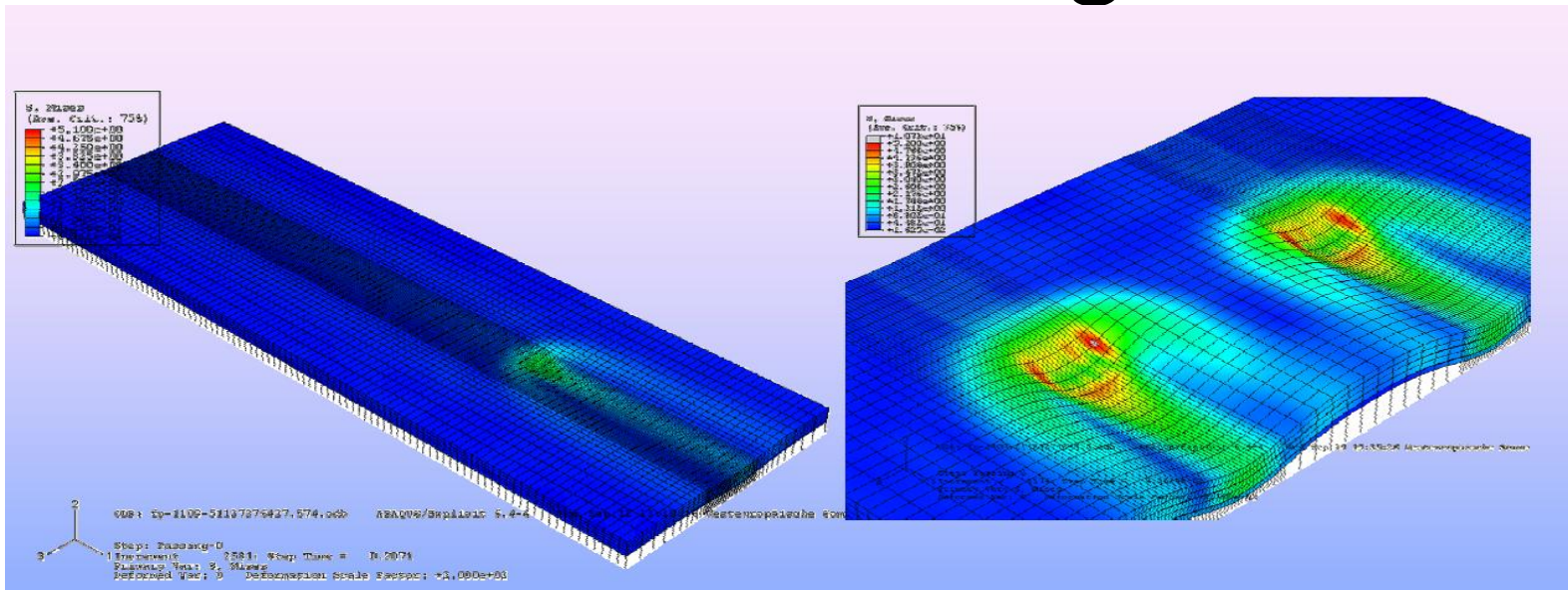


Weight bridge

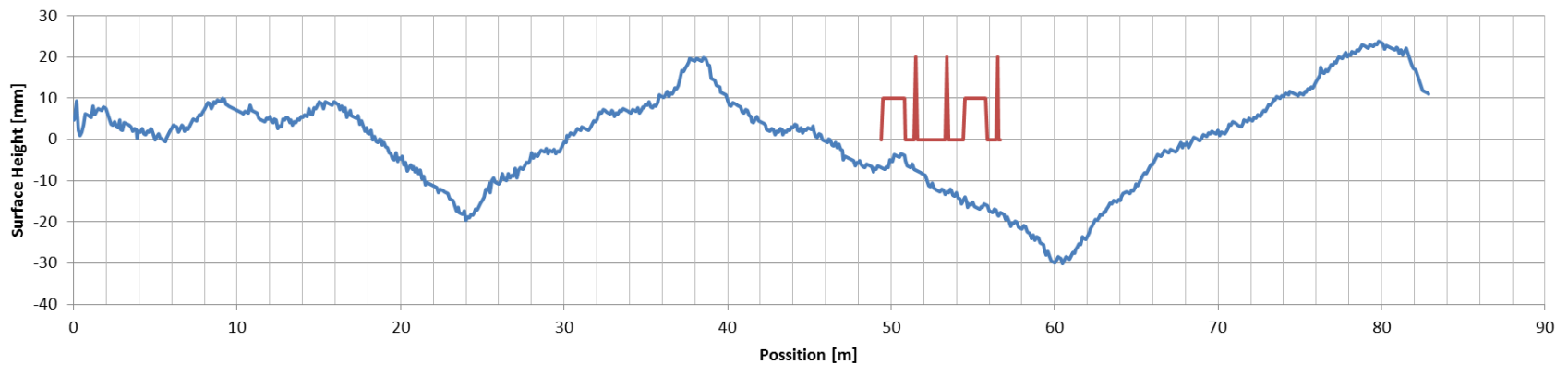


Workshop Weigh-In-Motion for enforcement, Amsterdam 2014

# Visco-elastic loading effect



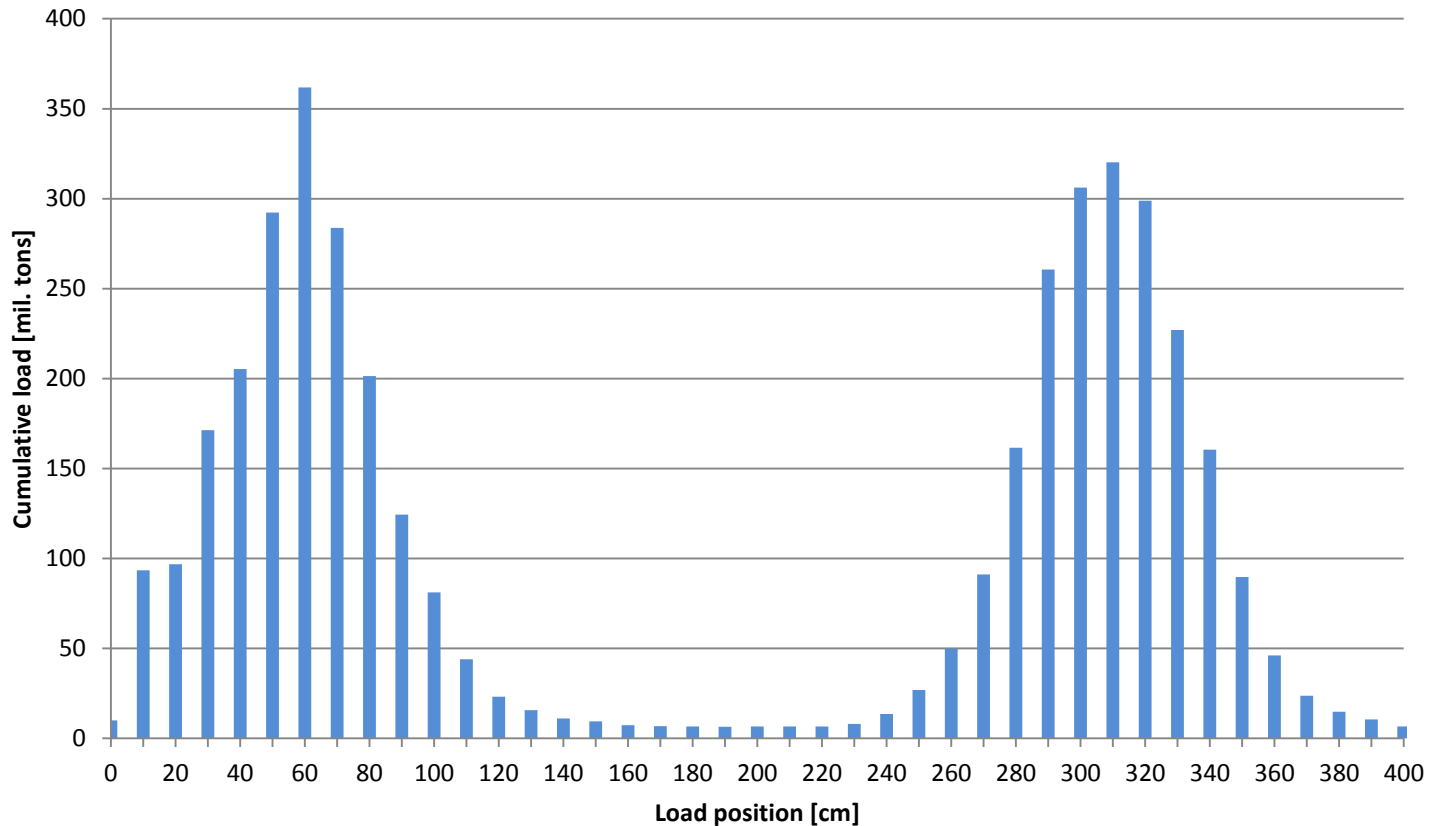
## Road Profile (without longitudinal slope)



# Cumulative load

## Footprint - traffic lane laterall profile

**Cumulative load [mil. tons] for vehicles over 12 t  
(pilot WIM enforcement - period 1.7. to 1.10. 13, 4.18 mil t, 211 534 veh.)**



■ Cumulative load [mil. tons]

# Pilot project „CESTI“

## **ADMINISTRATION**

- *Ministry of Transport of Czech Republic - CZ, Prague*
- *Highway & Road Administration of Czech Republic – CZ, Prague*

## **METROLOGY**

- *Czech Metrological Institute – CZ, Brno*

## **RESEARCH**

- *Transport Research Centre – CZ, Brno*

## **TRANSPORT OPERATOR**

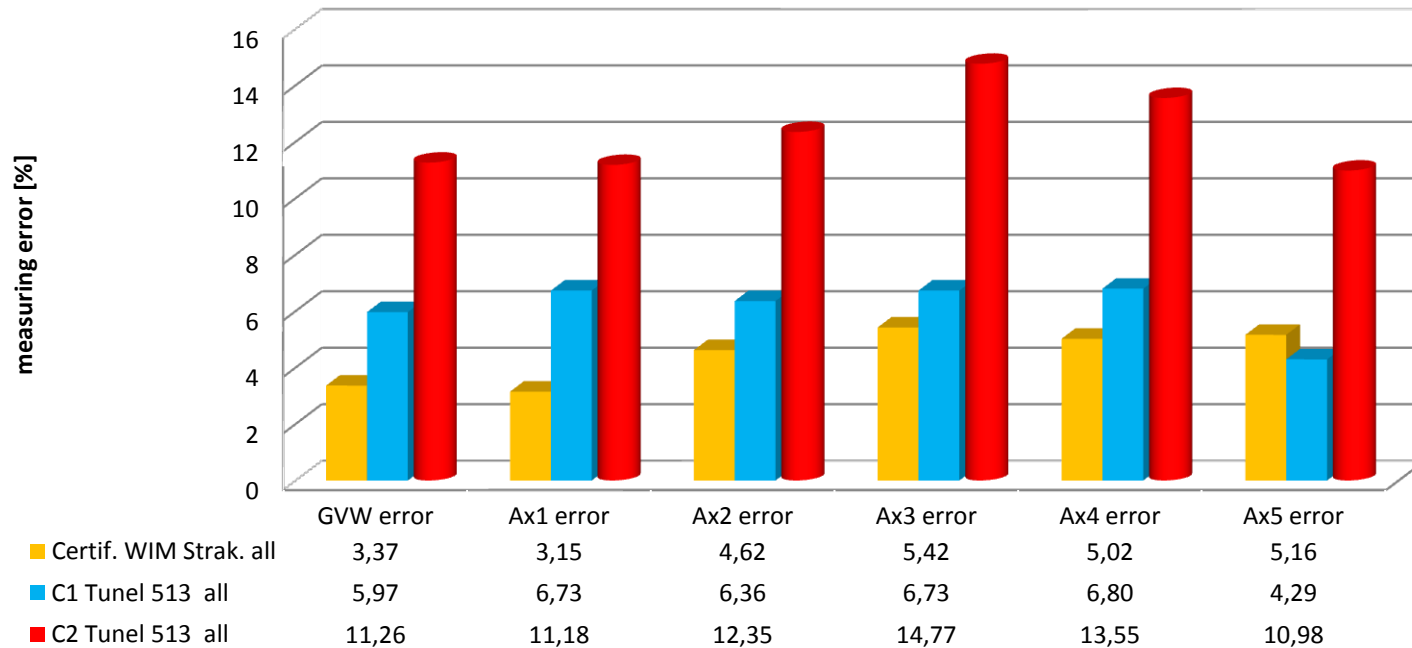
- ***CESMAD Bohemia - Association of Road Transport Operators - CZ***

## **PRIVATE COMPANIES**

- *RTS GmbH - CH, Zurich*
- *Kistler Instrumente AG – CH, Winterthur*

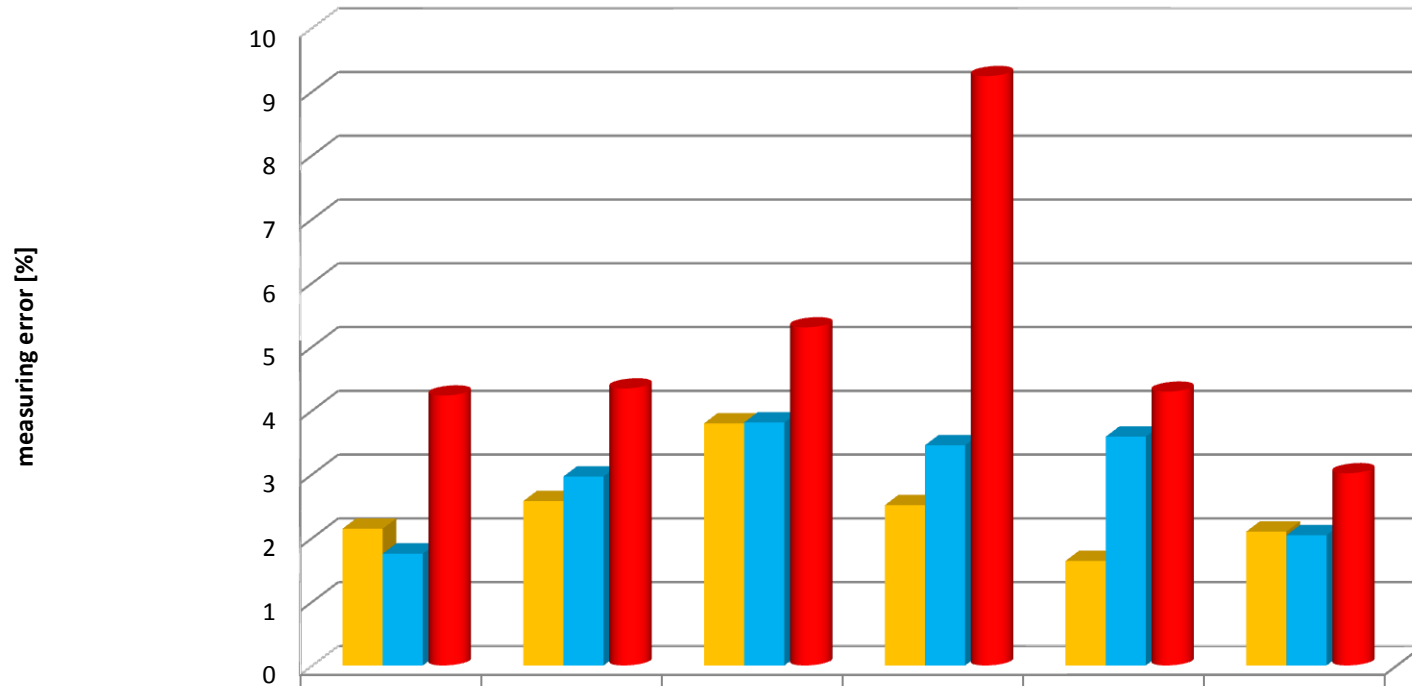
# All measurements

**Standard deviation of WIM systems - All Measurements  
one enforcement system and two standard pre selection  
systems**



# Valid measurements

**Standard deviation of WIM systems - All Measurements**  
*one enforcement system and two standard pre selection systems*



	GVW error	Ax1 error	Ax2 error	Ax3 error	Ax4 error	Ax5 error
■ Certif. WIM Strak. valid	2,15	2,58	3,80	2,51	1,64	2,10
■ C1 Tunel 513 valid	1,75	2,96	3,81	3,45	3,59	2,04
■ C2 Tunel 513 valid	4,23	4,34	5,30	9,24	4,29	3,01



# Results

>600 measured vehicles dynamic & static

Test direct enforcement

**All** measured vehicles 100%

**VALID** measured vehicles 65% to 70%

**30% to 35%** of potential overloaded vehicles **can not be** penalised based on the HS WIM measurement results

**65% to 70%** of measured vehicles **can be** penalised based on the **VALID HS WIM** measurement results

# Pre-selection effectiveness in PL

Datum	Time	Certified static weight system						GVW [t]
		AX 1	AX 2	AX 3	AX 4	AX 5	AX 6	
2012-12-14	10:57	7,30	12,50	3,85	3,85	3,85		31,35
2012-12-14	13:49	7,80	10,55	10,45	10,15	10,35		49,30
2012-12-14	21:20	6,95	8,65	11,30	11,30	11,40		49,60
2012-12-15	04:33	6,55	13,20	6,65	6,65	6,70		39,75
2012-12-15	05:53	6,90	11,35	8,30	8,40	8,65		43,60
2012-12-15	09:04	7,95	11,25	7,25	11,20	9,45		47,10
2012-12-15	11:42	6,25	12,90					19,15
2012-12-15	13:47	5,90	3,85	6,50	9,65	9,75	9,75	45,40

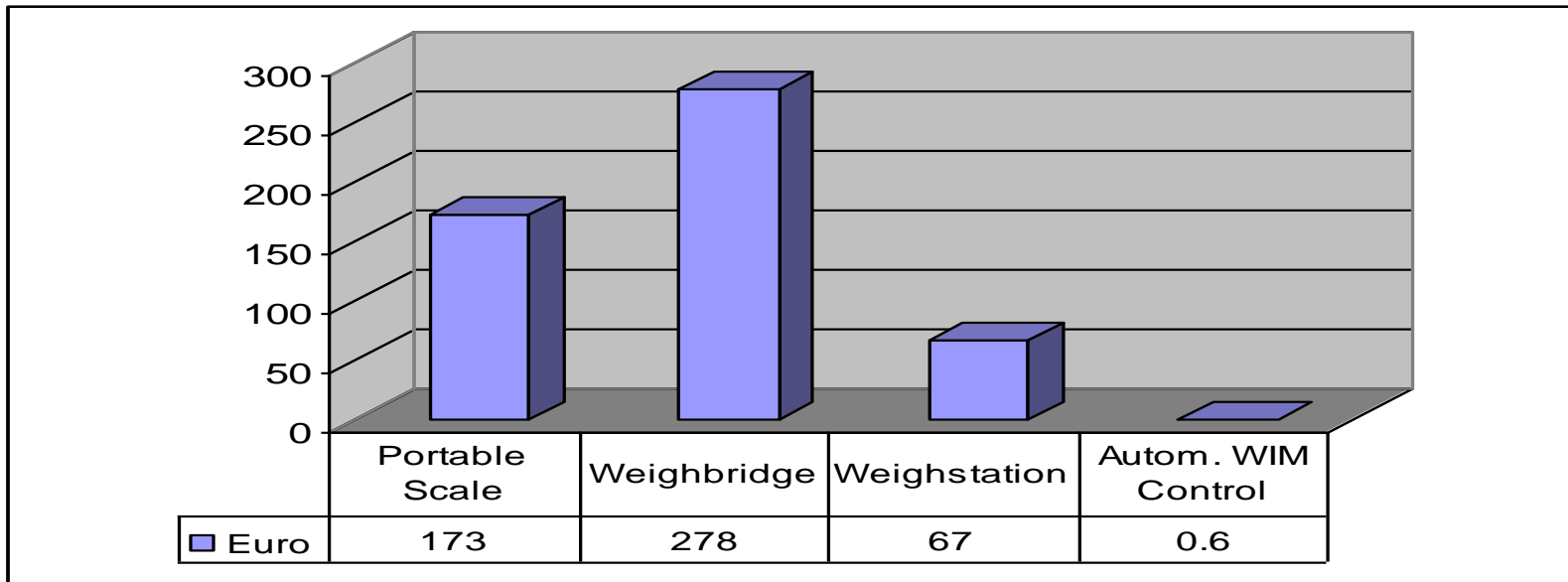


**IBDiM – WIM system Unicam, Camea**

Error	AX 1	AX 2	AX 3	AX 4	AX 5	AX 6	GVW [t]
<b>+1,12%</b>	7,10	12,90	4,10	3,70	3,90		31,70
<b>-1,01%</b>	7,50	11,20	9,50	10,40	10,20		48,80
<b>-0,81%</b>	6,40	9,20	11,30	11,20	11,10		49,20
<b>-0,63%</b>	6,20	13,30	6,80	6,60	6,60		39,50
<b>+0,00%</b>	6,70	11,60	8,20	8,40	8,70		43,60
<b>-0,85%</b>	7,20	12,00	7,30	10,90	9,30		46,70
<b>-0,78%</b>	6,20	12,80					19,00
<b>+0,22%</b>	7,00	9,40	9,70	9,70	9,70	9,70	45,50

# Weighing costs

## Top Trial project Germany



# Practical effectiveness of direct enforcement

2013-05-18 13:46:07.731 | Novosibirsk - Krasnoobsk to Sovetsky

50 005 кг 59 км/ч  
 В030В054 - RU тягач с трехосным прицепом L 16,50 м

**Обзорное изображение**

**Подробное изображение**  
 Детальное изображение не доступно.

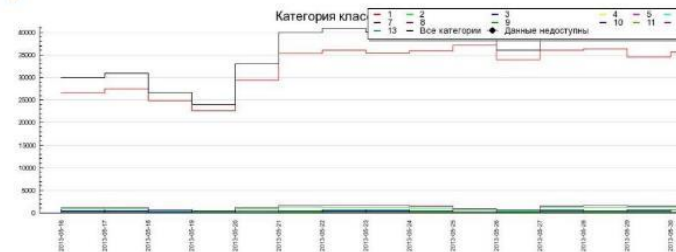
**Перегрузка**

Ось/группа	Лимит	Результаты измерения	Отклонение
группа# 4,5,6	24000 кг	26872 кг	11,97 %
общая масса# 1,2,3,4,5,6	44000 кг	50005 кг	13,65 %

**Результаты измерения**

Ось	Налево	Направо	Всего	Сдвоенное
1	3060 кг	3226 кг	6286 кг	Нет
2	4156 кг	4168 кг	8324 кг	Да
3	4185 кг	4358 кг	8523 кг	Нет
4	4081 кг	4994 кг	9054 кг	Нет
5	4313 кг	4741 кг	9054 кг	Нет
6	4627 кг	4136 кг	8763 кг	Нет
<b>Всего</b>	<b>24382 кг</b>	<b>25623 кг</b>	<b>50005 кг</b>	

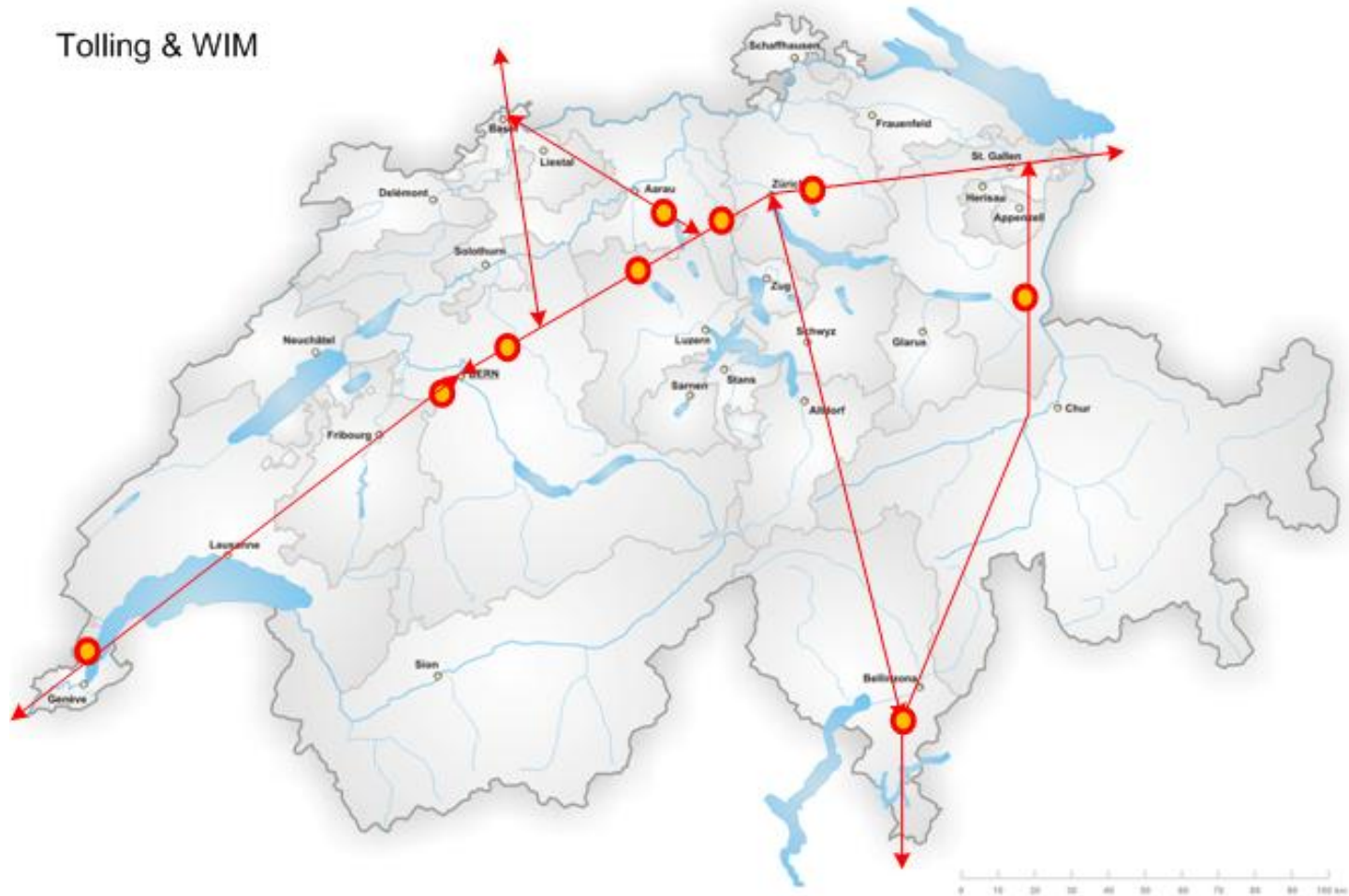
**Распределение массы по осям ТС**



Дата	Класс 1	Класс 2	Класс 3	Класс 4	Класс 5	Класс 6	Класс 7	Класс 8	Класс 9	Класс 10	Класс 11	Класс 12	Класс 13	Классы I	Перегрузка I
2013-05-16	26496	915	419	25	42	128	0	60	323	74	111	1221	248	30362	21
2013-05-17	27444	912	411	39	41	162	0	51	360	73	97	1198	260	30925	41
2013-05-18	24811	471	250	14	19	47	0	29	182	38	60	568	155	26556	10
2013-05-19	22558	336	125	18	29	39	1	22	160	17	41	413	155	23822	6
2013-05-20	28359	905	415	25	43	95	1	71	411	72	117	1254	203	32972	19
2013-05-21	35220	1288	482	31	75	154	5	91	512	94	145	1593	253	38953	29
2013-05-22	36081	1144	489	58	58	175	2	98	566	88	160	1629	271	40810	37
2013-05-24	35881	1111	412	31	59	128	3	85	490	110	157	1526	267	40250	21
2013-05-25	37089	702	349	31	43	76	0	60	262	48	77	883	279	39899	27
2013-05-23	35482	1231	409	39	64	146	2	75	542	99	161	1587	297	40990	23
2013-05-26	33952	476	209	17	15	51	0	30	207	26	56	661	305	35997	15
2013-05-27	36010	1159	572	26	57	125	1	94	516	84	175	1552	318	40899	24
2013-05-28	36286	1233	605	40	59	142	0	87	626	133	174	1672	323	41171	35
2013-05-29	34812	1164	538	41	64	145	1	92	484	125	161	1582	278	39187	37
2013-05-30	35595	1208	627	37	84	145	1	97	532	166	134	1579	171	40306	34
<b>Общая сумма</b>	<b>488753</b>	<b>14255</b>	<b>6300</b>	<b>472</b>	<b>743</b>	<b>1888</b>	<b>17</b>	<b>1052</b>	<b>6025</b>	<b>1190</b>	<b>1826</b>	<b>18917</b>	<b>3745</b>	<b>542993</b>	<b>300</b>

Создать отсортированные данные в формате CSV

# Tolling enforcement & WIM enforcement



# Tolling enforcement & WIM enforcement

## Equipment of existing Tolling stations by WIM systems



# Conclusion

- Traffic Monitoring gives substantial Data for Infrastructure use and Development
- Weight Monitoring helps to protect infrastructure and prosecute violation
- Weight Enforcement is a strategy to put cost of use to the users
- Infrastructure management based on facts can take place
- The quartz based Lineas<sup>®</sup> Sensor is the product of choice for dynamic WIM monitoring and Weight enforcement.