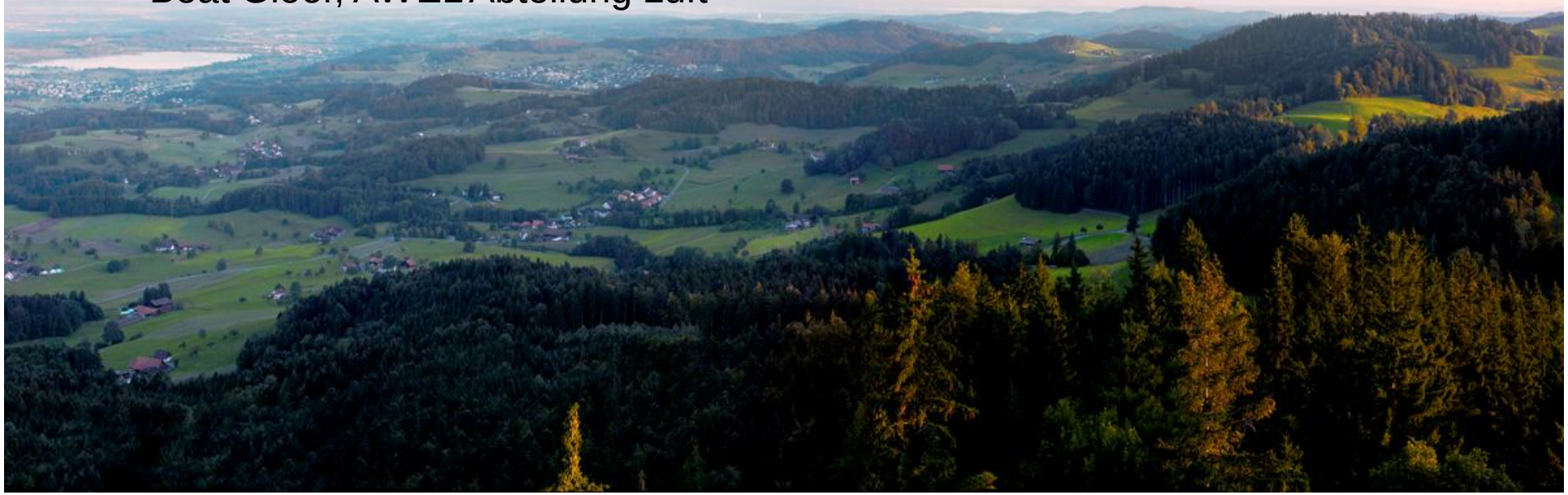
Kanton Zürich
Baudirektion
AWEL

Survey about functional-efficiency of DPF during PTI in Zürich

Beat Gloor, AWEL Abteilung Luft



contents

- definition of the project
- approach – basic points
- measuring equipment
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- conclusion

the project

- cars comes for the PTI
- only diesel cars
- if possible only Euro 5b → Euro 6….
- use and test different PN-measuring equipments
- communicate the measuring technique, feasibility, time required

requirements

- no disturbance during PTI
- no consequences for DPF malfunction → wording

method

- data sheet for one week,
- 7 lanes at the same time to monitor
- to pick the relevant cars
- PN-measuring (2 equipments) during the PTI (drive to or from the control basement)
- notice the value , complete data set if necessary, identify DPF under the car

PN-measuring equipment

- P-Trak (TSI) → CPC
- Disc-mini (testo) → diffusion charging
- Partector with heating (naneos) → diffusion charging
- NPET (TSI) → metas-approved PN-measuring equipement for diesel engines with dilution, dilution rate 1:10 and heating to 350°C (CPC) power: 240V AC

Equipment

P-Trak

Disc-mini

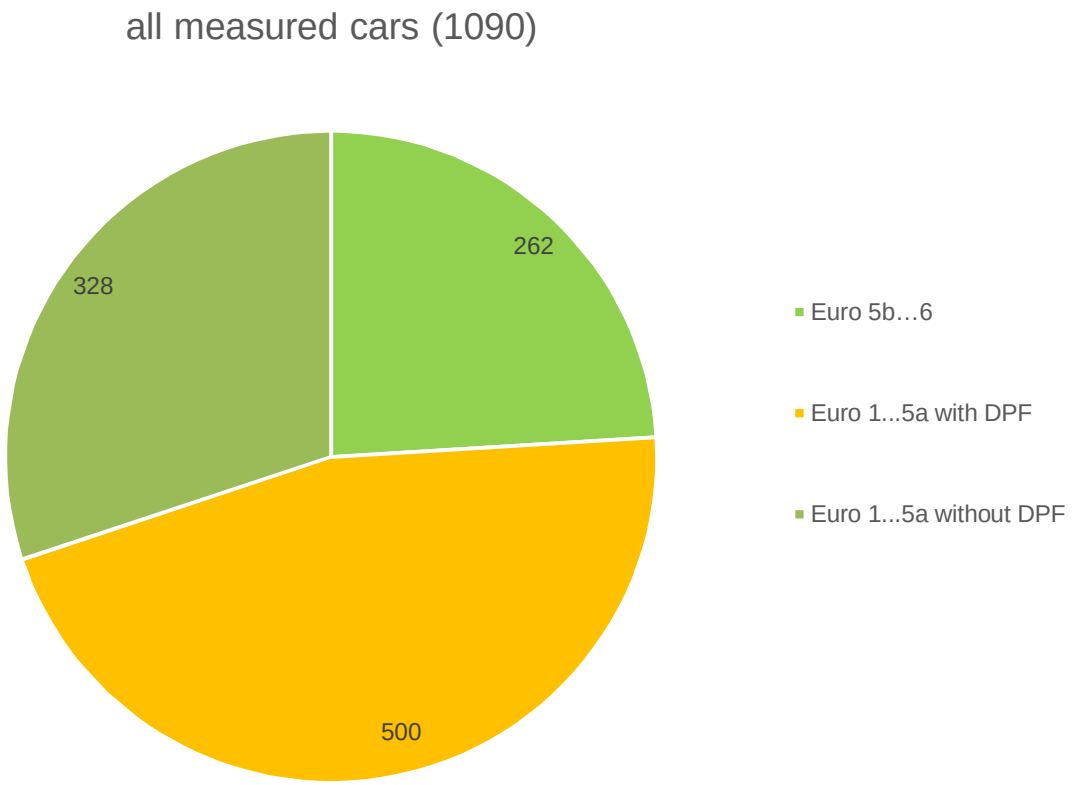
NPET

Partector

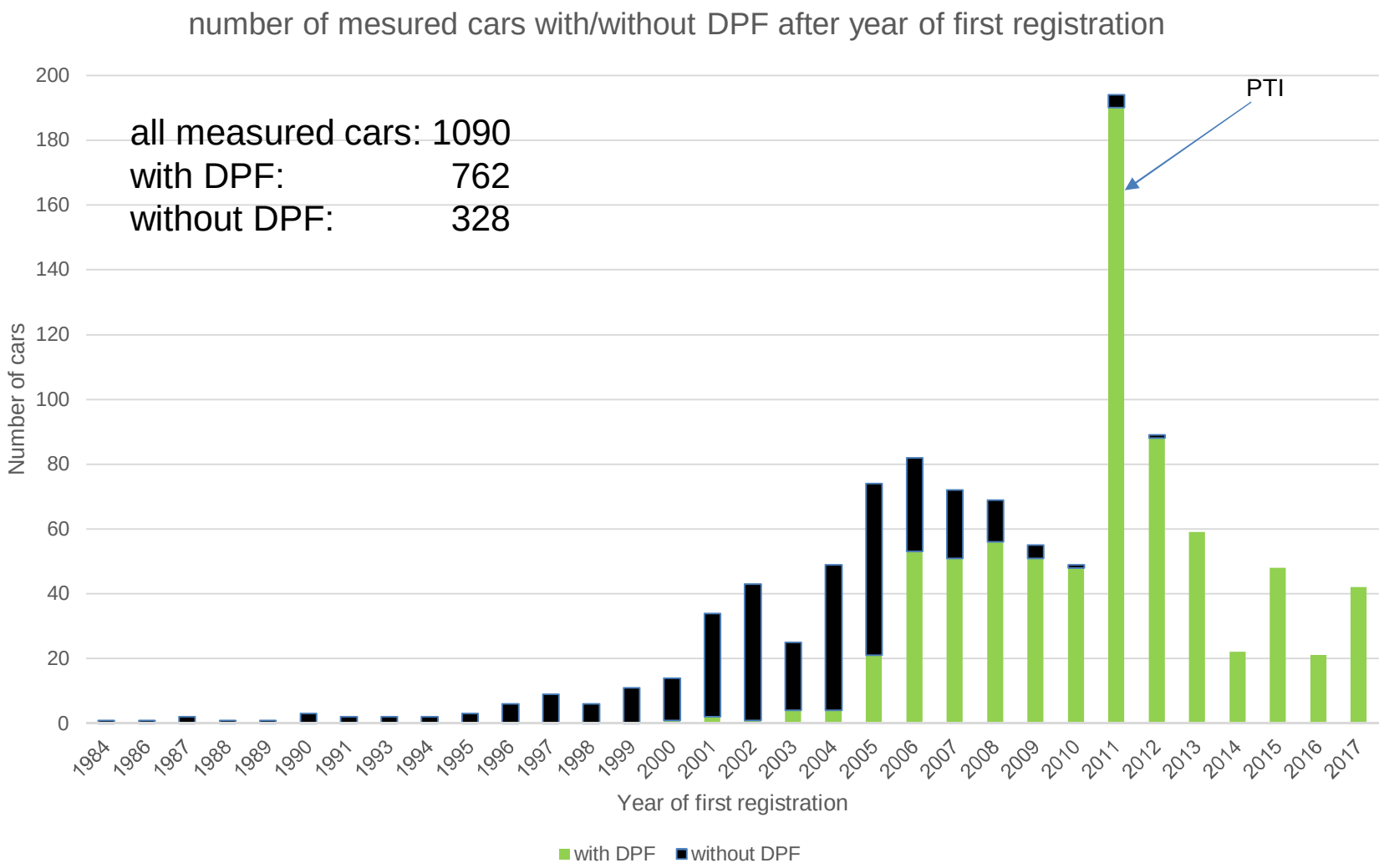
method by evaluation the results

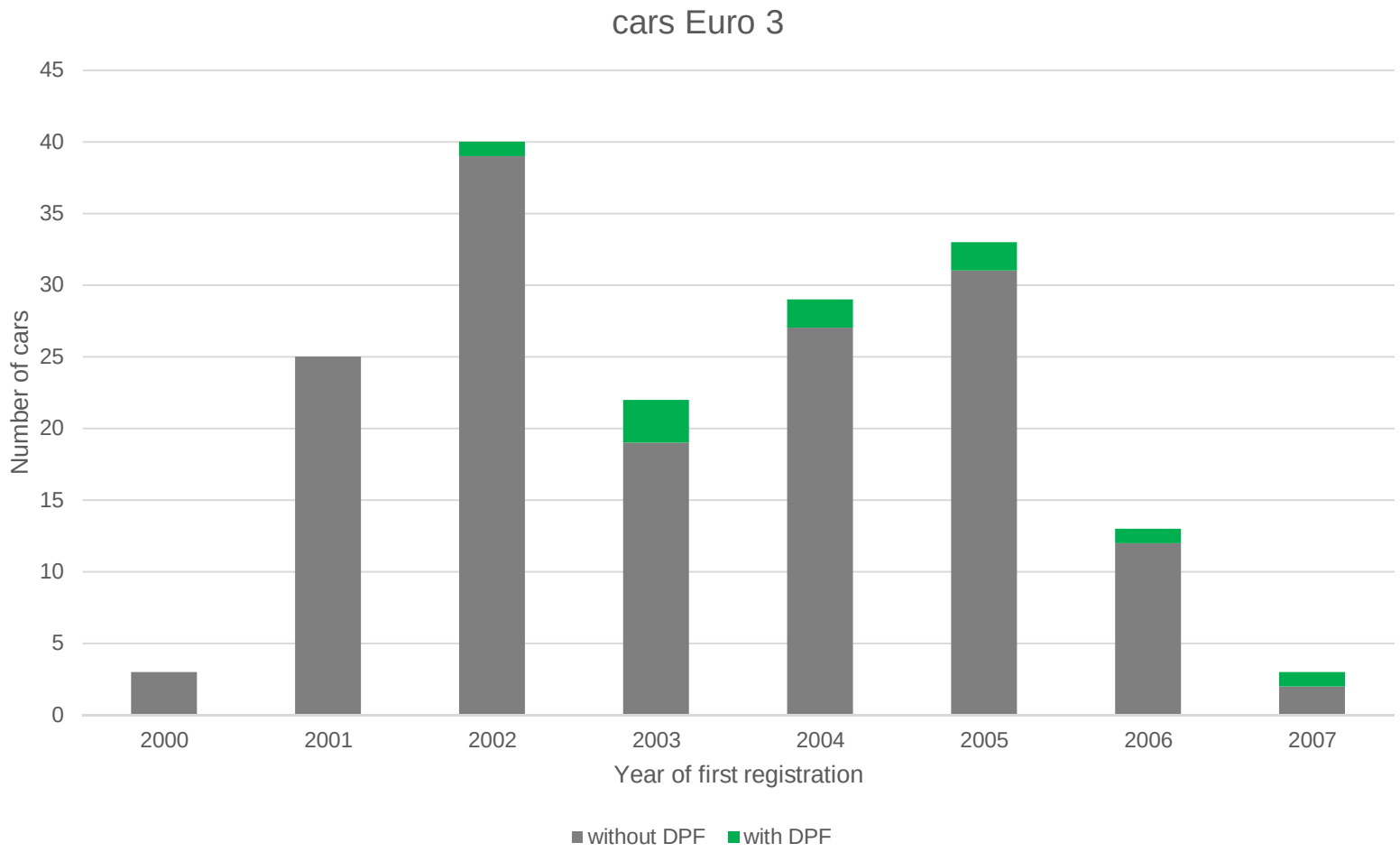
- List of examined cars and there measured values
  → Euro 5b or younger → always DPF present
  → Euro 5a oder older
    measured value ≤ 300’000 → DPF present
    measured value > 300’000
      database of cars by Road Traffic Licensing Department:
        a) with COC → DPF yes/no
        b) without COC → comparison with the same cars with COC and the same year of first registration → DPF yes/no

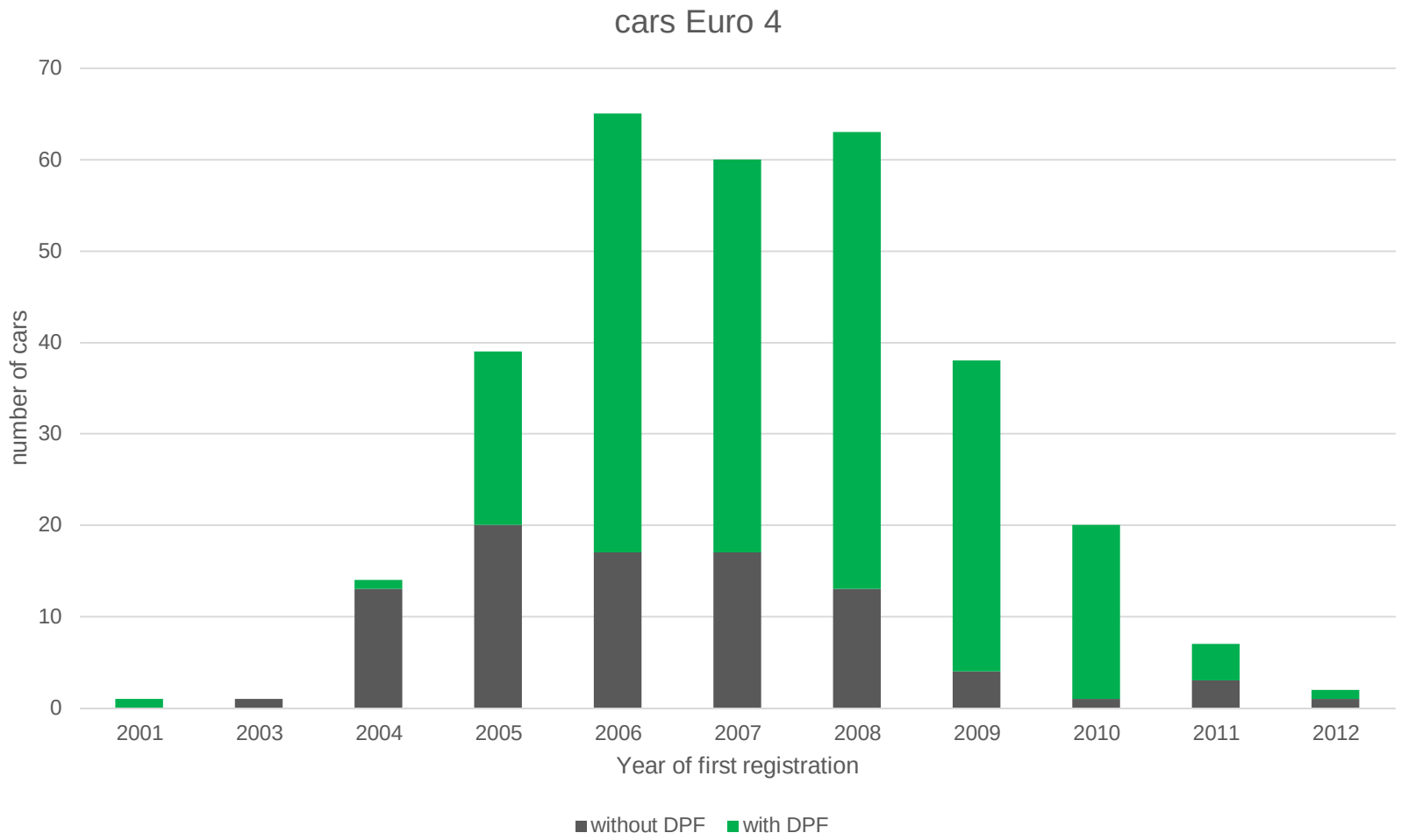
all cars - with and without DPF

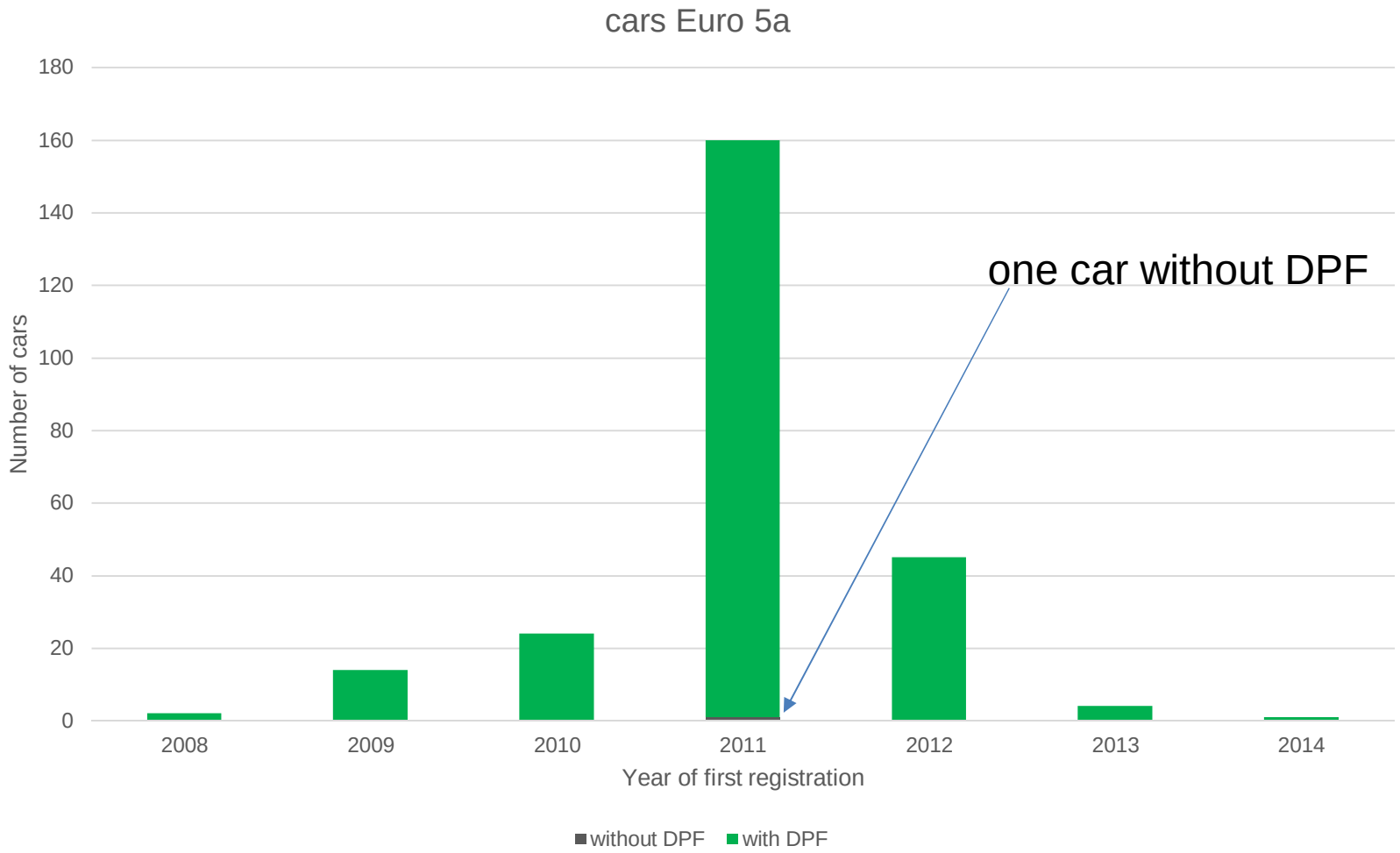


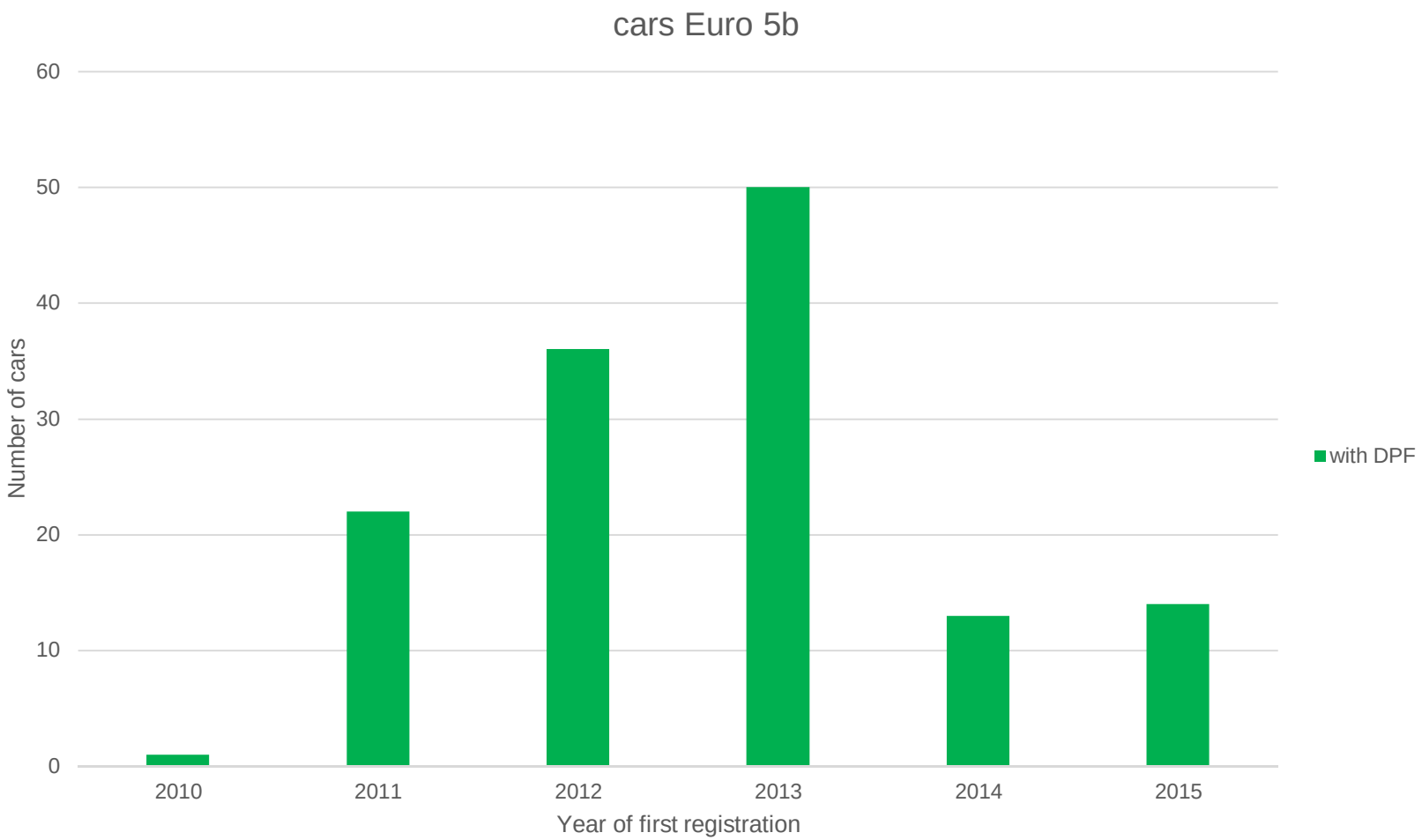
results


number of mesured cars with/without DPF after year of first registration
all measured cars: 1090
with DPF: 762
without DPF: 328
PTI
Number of cars
Year of first registration
with DPF
without DPF

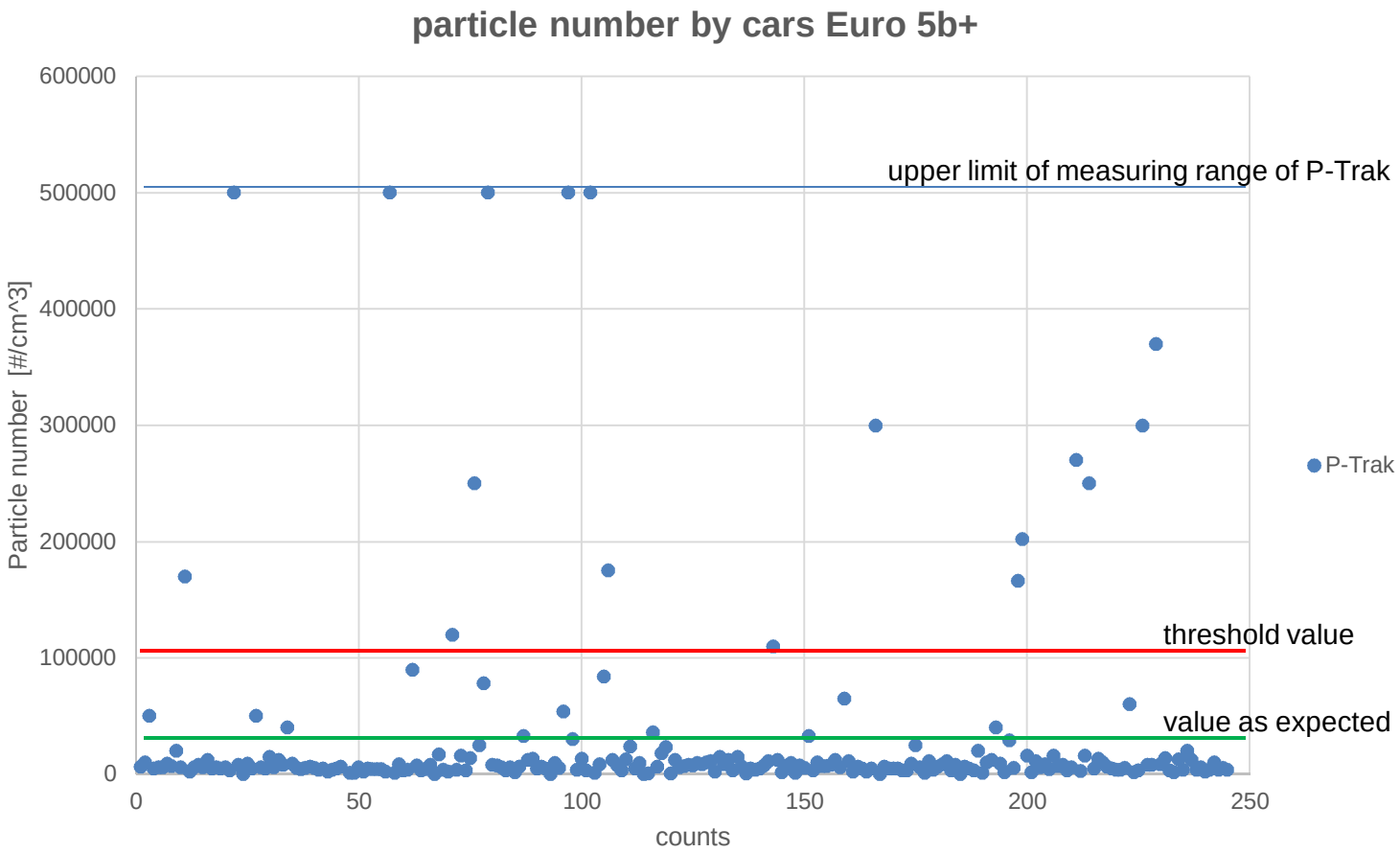

cars Euro 3
45
40
35
30
25
20
15
10
5
0
Number of cars
2000
2001
2002
2003
2004
2005
2006
2007
Year of first registration
without DPF
with DPF


cars Euro 4
number of cars
70
60
50
40
30
20
10
0
2001
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year of first registration
without DPF
with DPF

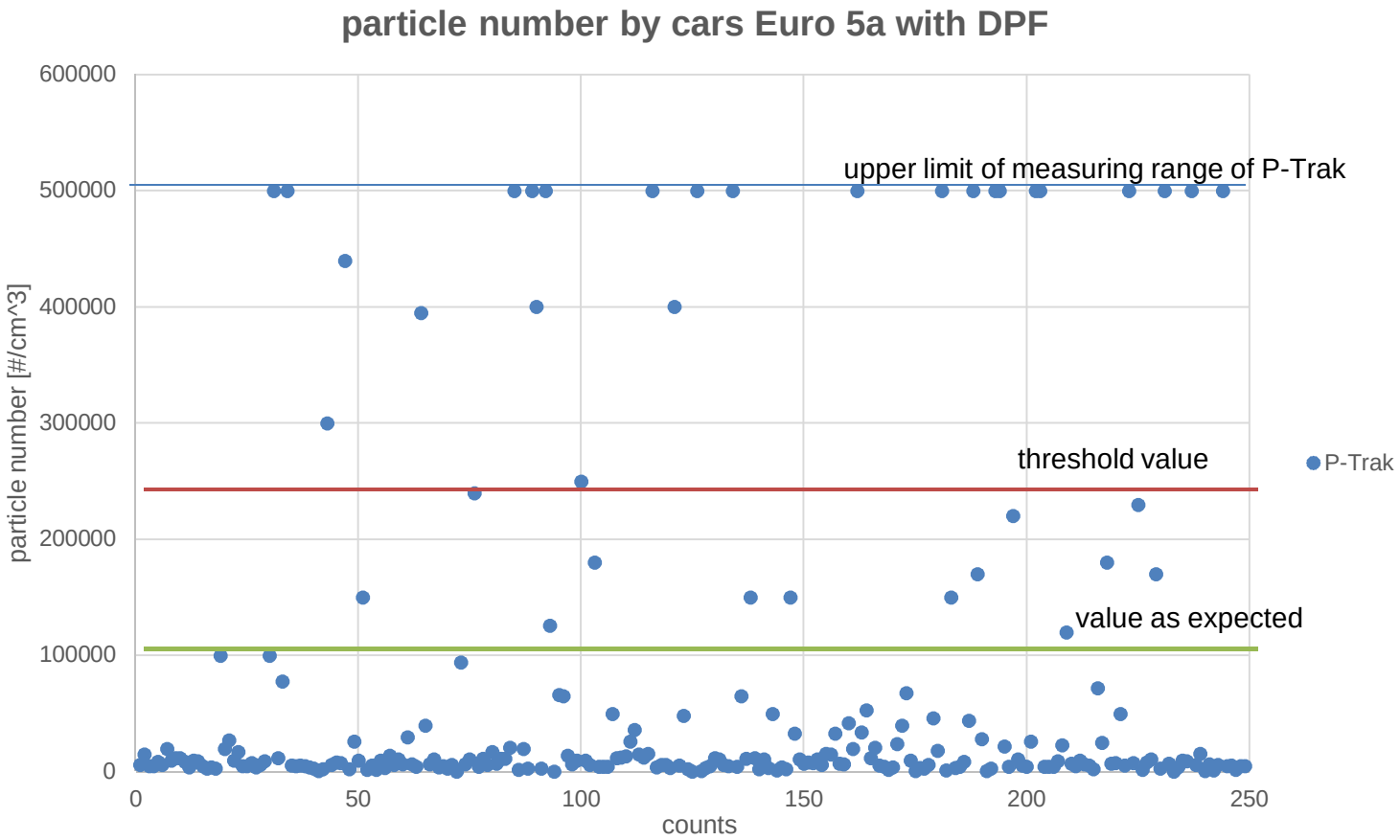

cars Euro 5a
180
160
140
120
100
80
60
40
20
0
Number of cars
one car without DPF
2008
2009
2010
2011
2012
2013
2014
Year of first registration
without DPF
with DPF


cars Euro 5b
60
50
40
30
20
10
0
Number of cars
2010
2011
2012
2013
2014
2015
Year of first registration
with DPF

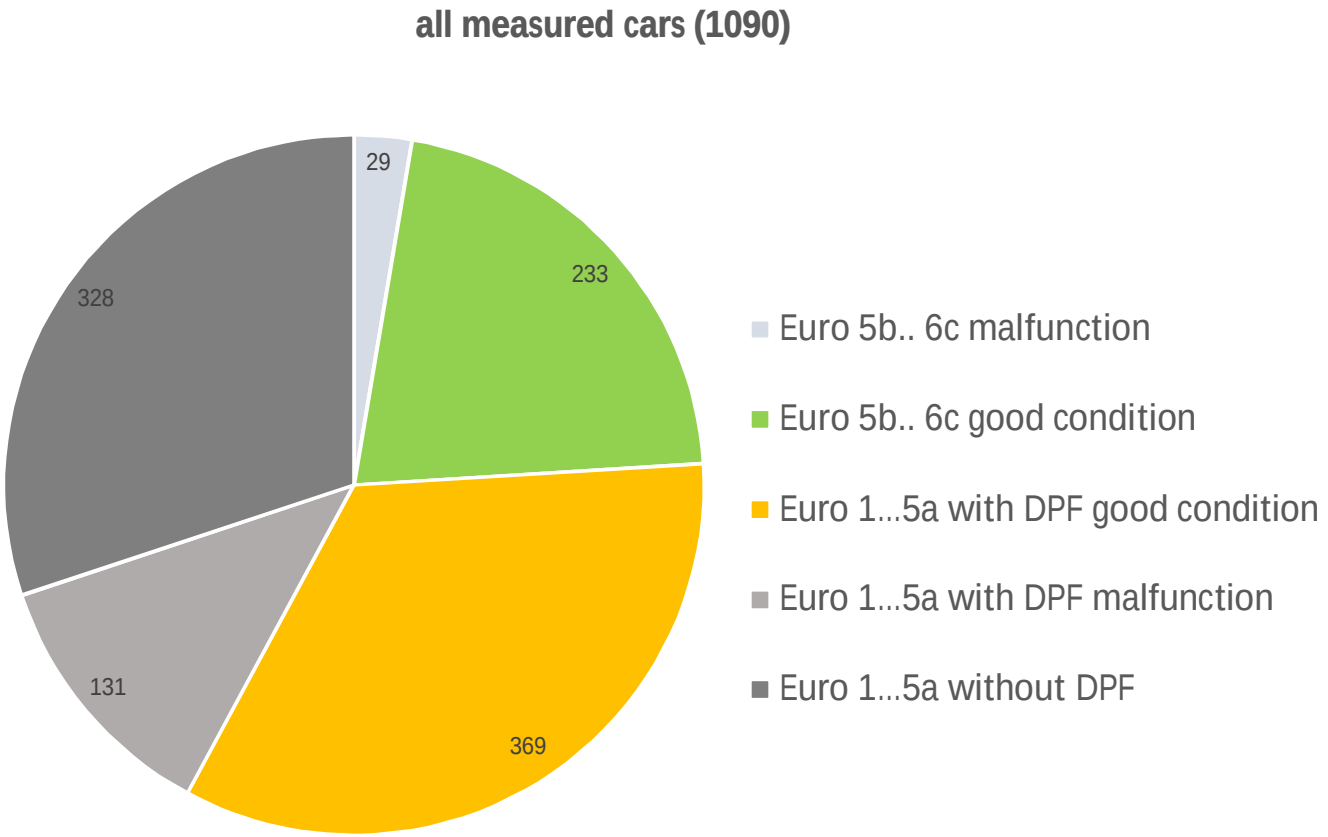
results

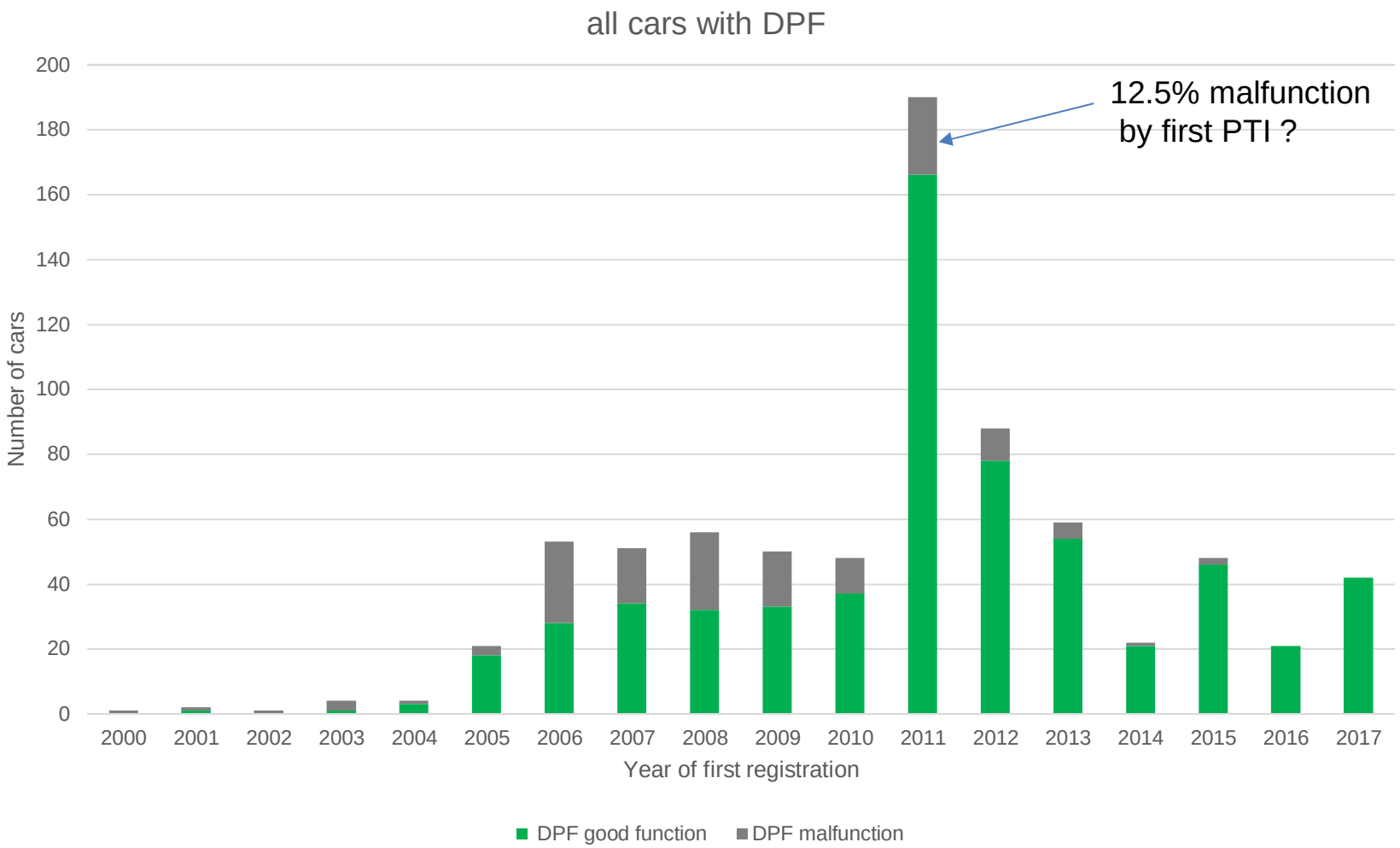

particle number by cars Euro 5b+
600000
500000
400000
300000
200000
100000
0
Particle number [#/cm^3]
0
50
100
150
200
250
counts
upper limit of measuring range of P-Trak
threshold value
value as expected
P-Trak

results


particle number by cars Euro 5a with DPF
600000
500000
400000
300000
200000
100000
0
particle number [#/cm^3]
0
50
100
150
200
250
counts
upper limit of measuring range of P-Trak
threshold value
value as expected
P-Trak

Evaluation of all measured cars




all cars with DPF
12.5% malfunction
by first PTI ?
Number of cars
200
180
160
140
120
100
80
60
40
20
0
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Year of first registration
DPF good function
DPF malfunction

results about the investigation due to emission-standard and DPF-obligation

DPF-obligation

B5b->B6...	**>100'000**	>30'000	<30'000
Total	**failure**	increased	good
262	29	14	219
100%	**11.1%**	5.3%	83.6%

no DPF-obligation

B00 <- B5a	B00 <- B5a	**B00 <- B5a**	**>250'000**	>100'000	<100'000
Total	no PFS	**with DPF**	**failure**	increased	good
828	328	500	131	28	341
		100%	**26.2%**	5.6%	68.2%
100%	39.6%	60.4%			

controlled cars with first registration 2011

190 cars with DPF

→ **159 cars Euro 5a**
→ 4 cars Euro 4
→ 22 cars Euro 5b
→ 5 buses Euro 5 (public transport)

cars Euro 5a by first registration 2011

190 cars w. DPF →159 cars B5a		total	def	%
reason:	**T**ec.	2	0	0
	Free	8	3	38
	Perio.	132	11	8
	empty	17	2	12
	total	**159**	**16**	**10%**

statistically evaluated results, no bias

conclusions

- we need a reliable battery powered PN-measuring equipment, of handy-size with a sufficient measuring range
- handy-size = like P-Trak or Partector
  battery capacity= 5 hours
  measuring ranged = 1000 – 10 million P/cm^3
- we need threshold value(s) for PN, as low as possible, as high as necessary
- we need an inspection instruction, for all nations in EU incl. CH, fast and reliable measuring, then we have a metas-approved method for cases near the threshold

Thanks: Strassenverkehrsamt Zürich, E. Schubiger
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Thank you very much for your attention!

Are there any questions?

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