



9.1.2016, Berne

Introducing myself



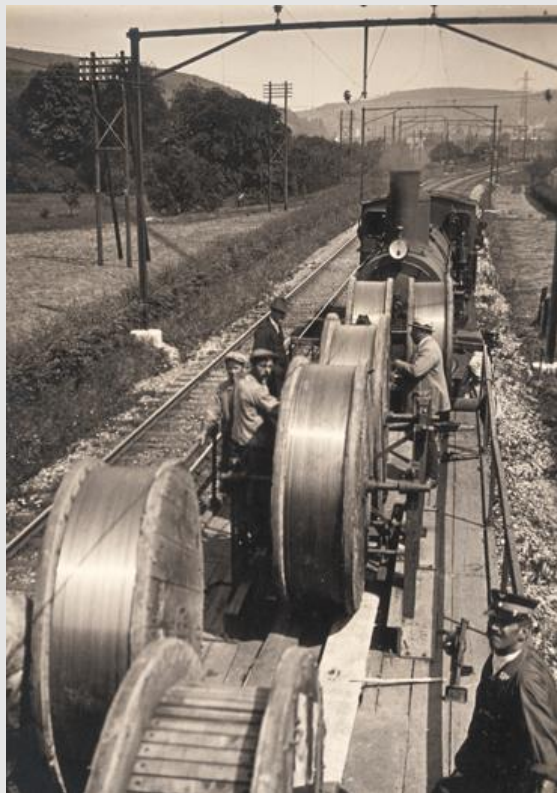
Michael Rietmann

Measuring Engineer, Office Bern
Responsible for DCM projects

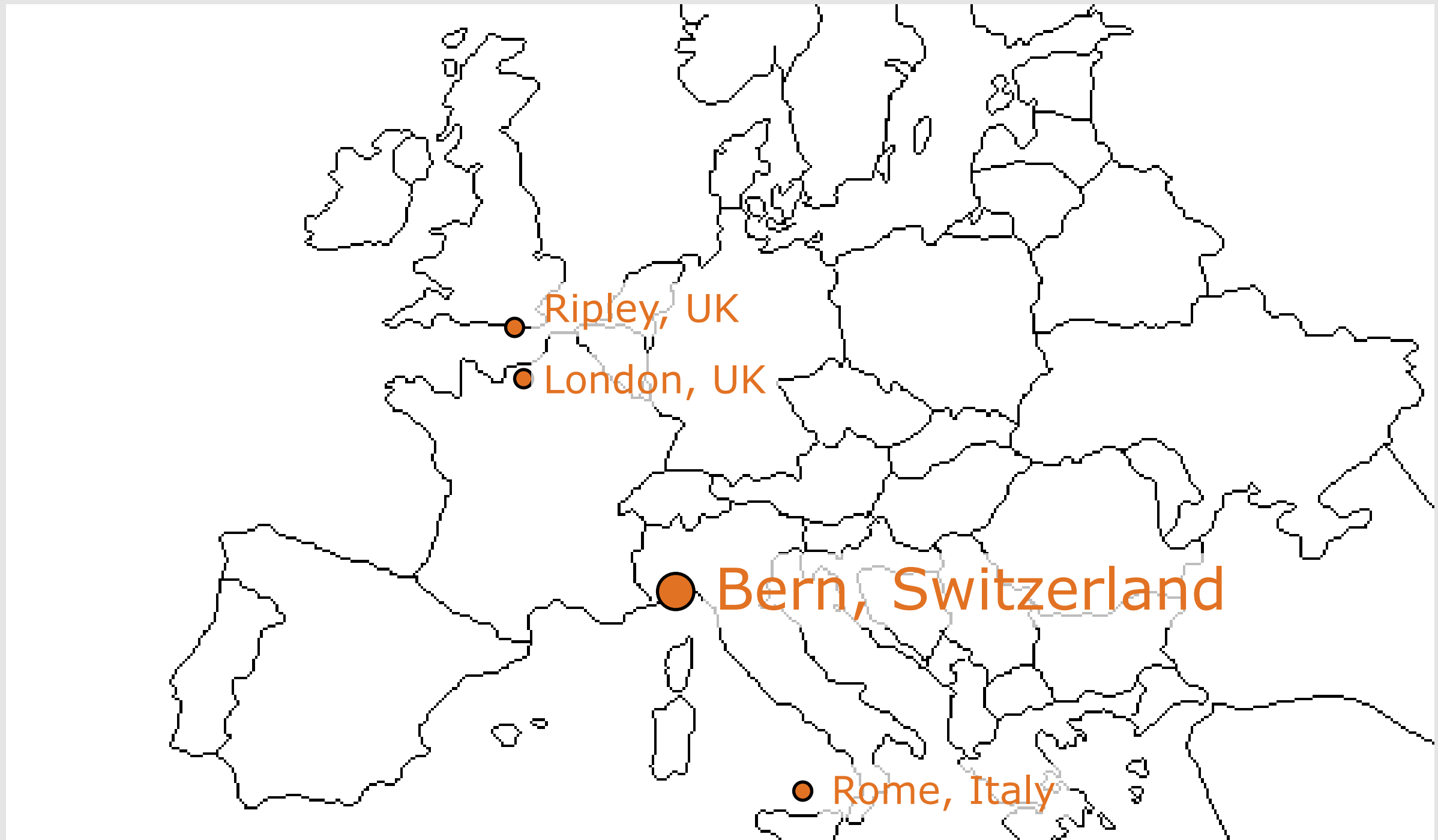
Background:

- Since February 2015 at F+F
- Degree Mechanical Engineer HF
- 5 years experience in manufacturing and assembly
- Apprenticeship as a polymechanic
- Swiss High School (Diploma)

History of Furrer+Frey

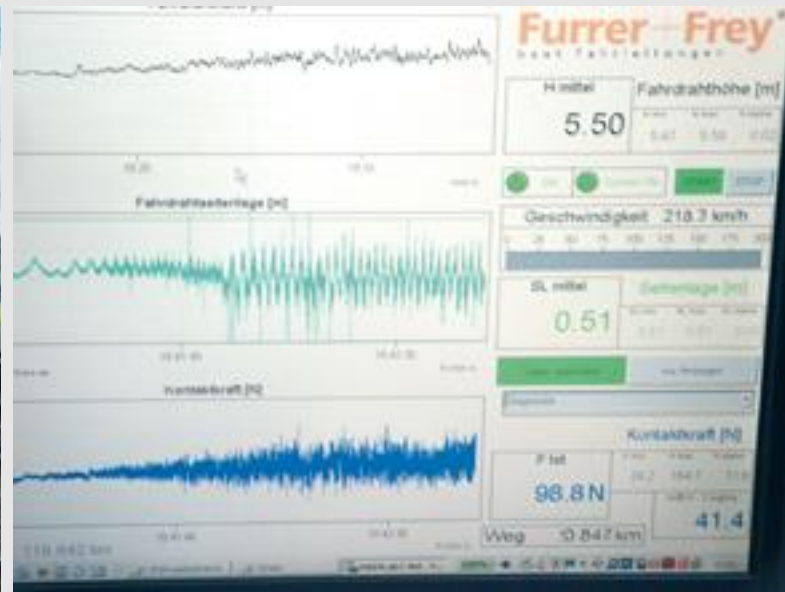


Locations

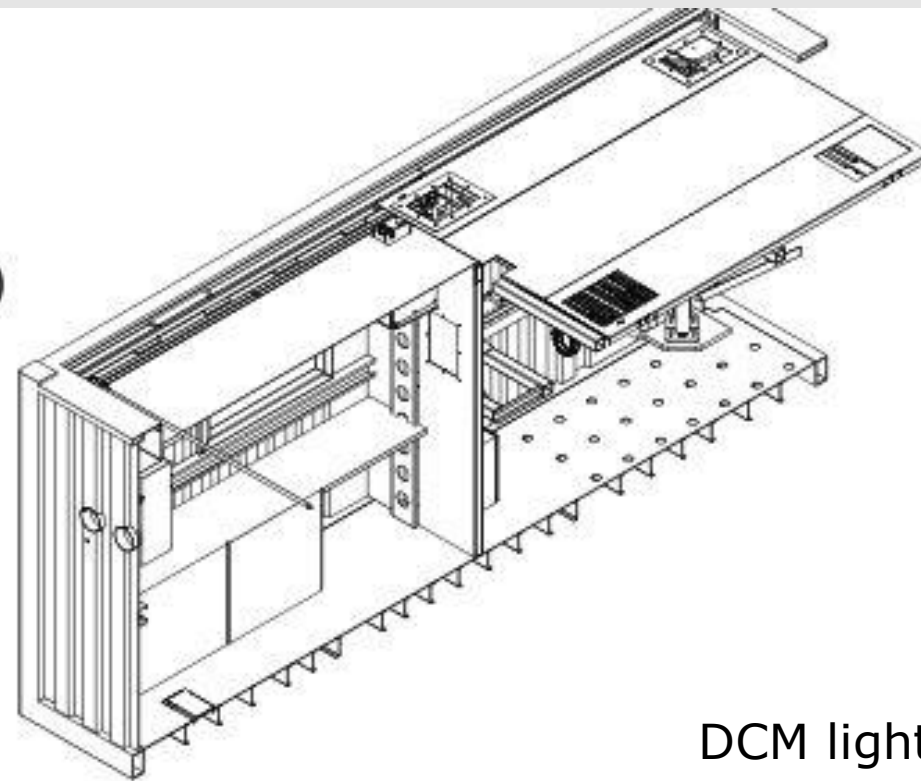


The system DCM and its development

Measuring system for the geometry of overhead contact lines



DCM2.0



DCM light



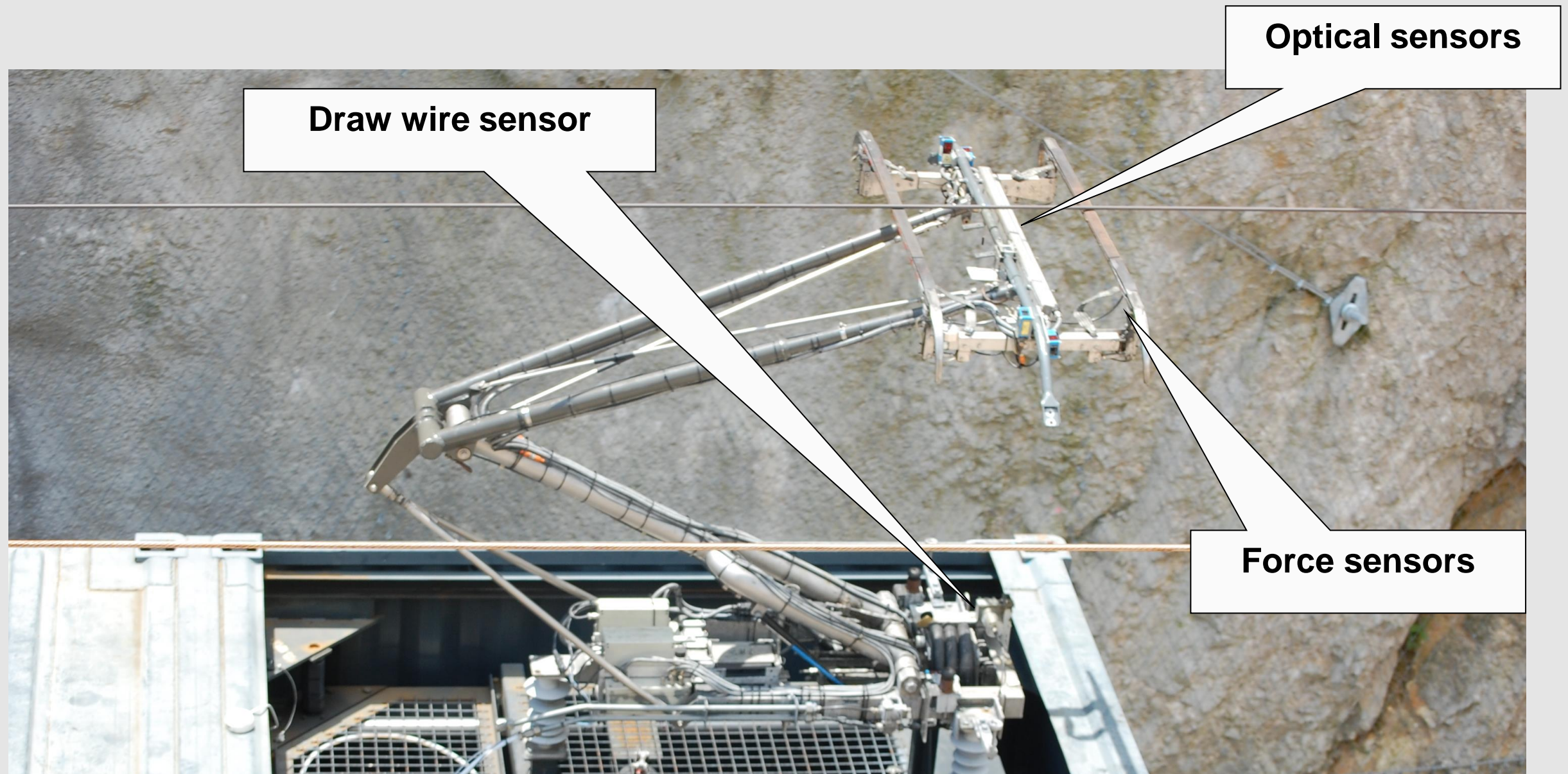
DCM stands for...

...static measuring all over the world

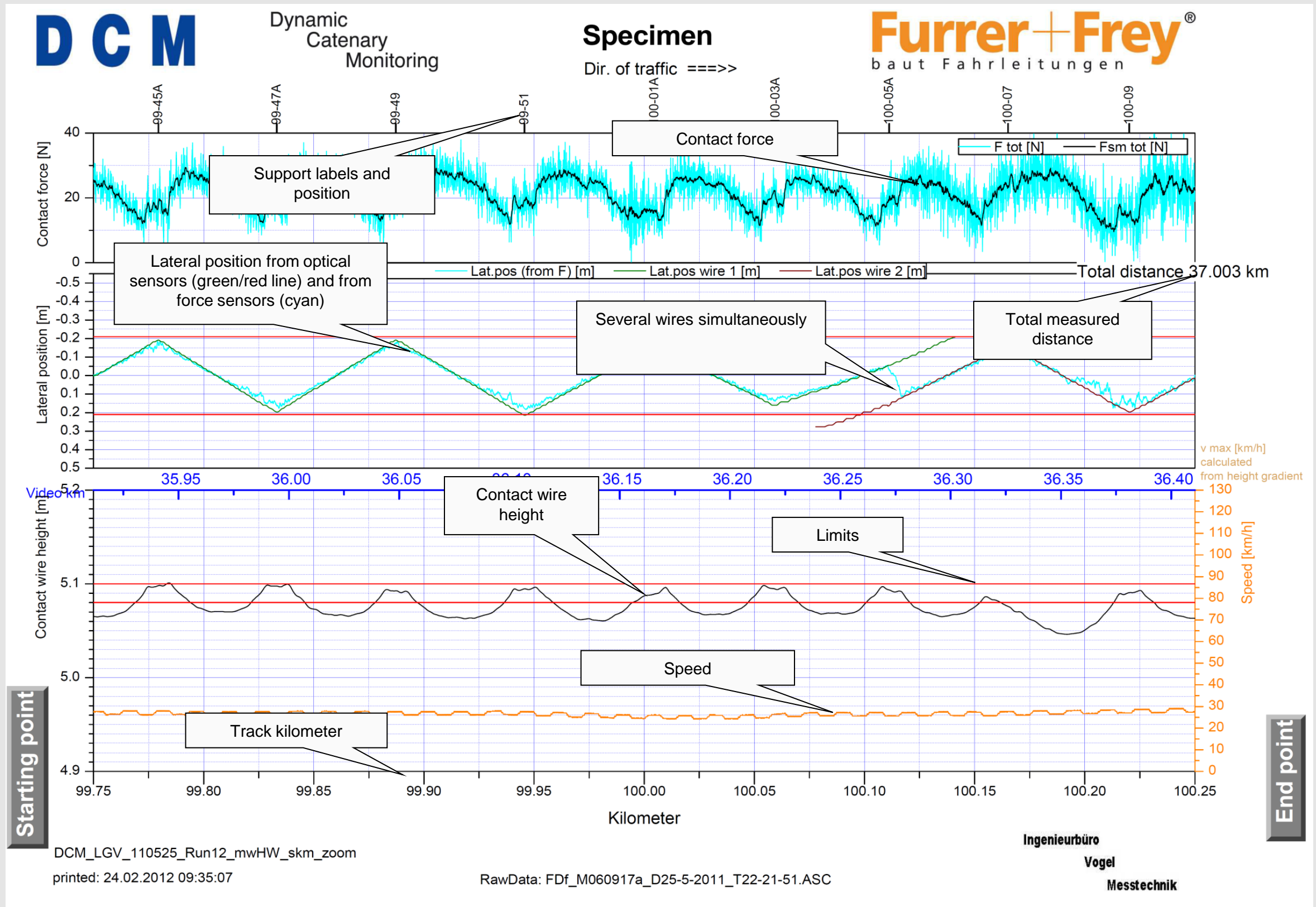


DCM: Sensors

Height, lateral position and contact force



DCM: Results



References and current project

List of references DCM (Dynamic Catenary Monitoring)

Furrer+Frey®
Overhead contact lines

Year	Comp.	Client	Project	Distance (km)	Voltage	Project remarks	Catenary (C) or conductor rail (CR)	Type	Gauge	Comment
2013	tpf	Transports publics fribourgeois	Givisiez - Suiez	20.00	1.5 kV DC	check of state	C	Outdoor	1435 mm	
2013	SBB	Swiss federal railways	Tunnel de Pierre-Pertruis	2.00	15 kV AC	check after construction	CR	Tunnel	1435 mm	
2013	SBB	Swiss federal railways	Le Locle	1.50	15 kV AC	check after construction	C	Outdoor	1435 mm	
2013	SBB	Swiss federal railways	Kreuzlibergtunnel	2.00	15 kV AC	check after construction	CR	Tunnel	1435 mm	
2013	DB	Alpine Energie Deutschland	Freilassing - Salzburg	2 x 0.7	15 kV AC	check after construction	C	Outdoor	1435 mm	
2012	SBB	Entlebuch	Trubschachen - Wohlusen	30.00	15 kV AC	check of state (open line) and check after construction (tunnels)	C & CR	Outdoor, 5 tunnels	1435 mm	
2012	SOB	Schweizerische Süd-Ost Bahn	Wasserfluhntunnel	4.00	15 kV AC	check after construction	CR	Tunnel	1435 mm	
2012	SOB	Schweizerische Süd-Ost Bahn	Aeschtunnel	0.20	15 kV AC	check after construction	CR	Tunnel	1435 mm	
2012	SBB	Swiss federal railways	Tunnels de Genève	5.00	15 kV AC	check after construction	CR	Tunnel	1435 mm	
2012	ÖBB	HC Electric	Lainzertunnel	2 x 10	15 kV AC	check after construction	CR	Tunnel	1435mm	
2012	TL	Transports publics lausanne et région	Line M1	16.00	750 V DC	check of state	C	Outdoor	1000 mm	
2011	tpf	Transports publics fribourgeois	Bulle - Romont	19.00	1.5 kV DC	check after construction, check of state	C	Outdoor	1435 mm	
2011	DB	Deutsche Bahn	Fürth-Vach	2 x 4	15 kV AC	check after construction	C	Outdoor, two tracks	1435mm	
2011	SBB	Swiss federal railways	Massaquotunnel	1.00	15 kV AC	check after construction	CR	Tunnel	1435 mm	
2011	SBB	Swiss federal railways	Basel Kannenfeld- and Schützenmatttunnel	4.00	25 kV AC	check after construction	C & CR	2 Tunnels	1435 mm	
2011	ÖBB	HC-Electric	Arlbergtunnel	2 x 10	15 kV AC	check of state after 1 year of service	CR	Tunnel	1435 mm	
2011	RFF	TSO Caténaire / INEXIA	LGV Rhin-Rhône	360.00	25 kV AC	final check of whole route network and connecting lines before test runs	C	Outdoor, 2 short tunnels	1435 mm	
2011	DB	Brandenburg International Airport station		12.00	15 kV AC	check after construction	CR	Tunnel	1435 mm	
2011	RFF	TSO Caténaire / INEXIA	LGV Rhin-Rhône	160.00	25 kV AC	check after setting of stagger and height (west part and connecting lines)	C	Outdoor, 2 short	1435 mm	
2010	RFF	TSO Caténaire / INEXIA	LGV Rhin-Rhône	200.00	25 kV AC	check after setting of stagger and height (east part)				
2010	RFF	TSO Caténaire / INEXIA	LGV Rhin-Rhône	325.00	25 kV AC	check after construction				
2010	zb	Zentralbahn	Engelbergtunnel	2 x 4.5	15 kV AC	check after construction				
2010	ÖBB	HC-Electric	Arlbergtunnel	10.00	15 kV AC	check after construction				
2010	SBB	Swiss federal railways	Balernatunnel	0.60	15 kV AC	check after construction				
2010	RFF	CEGELEC	Ligne du Haut Bugey	50.00	25 kV AC	check of initial state				
2010	RFF	Réseau Ferré de France	Ligne du Haut Bugey	10.50	25 kV AC	check after construction				

Total approx. 1340km have been measured by the DCM system! (2013)

CH: 280km
D: 100km
A: 60km
F: 900km

→ Ligne du Haut Bugey
→ LGV Rhine-Rhone
→ LGV Est Phase 2
→ **LGV Tours-Bordeaux**
300km, double track,
measured twice = 1200km to
measure.



Technical approval in Germany (DB) and Austria (Öbb)

By the way: LGV SEA is the biggest railway construction site in Europe!

Benefits of our system

The DCM measuring container...



- ...can be transported by rail, truck or ship.
- ...can be mounted on any flat wagon and gauge type.
- ...is operational within three hours after arrival at the final destination.
- ...is available on short notice.
- ...can be adapted to the client's needs including the analysis.
- ...can also be used for contact pressure and uplift measurements.
- ... is adjustable with different pan heads / contact strips.
- ... can be more than you might expect!

THANK YOU FOR YOUR ATTENTION!
ANY QUESTIONS??

Furrer+Fre^y
Overhead contact lines