NPL
National Physical Laboratory

EUROMET TC-Length

Chairman's Annual Report (2005/2006)

EUROMET General Assembly
Vienna, Austria, 31 May - 2 June 2006

EM-GA_06_O.07.12

Andrew Lewis, NPL

Outline

- Project statistics (numbers, participation, coordination)
- Status of key comparisons: CCL and EUROMET
- New style of CCL-RMO key comparison – now running
- Linking of comparisons in CCL/EUROMET TC-L
- Status of length CMC submissions
- Meetings & workshops
- iMERA roadmapping

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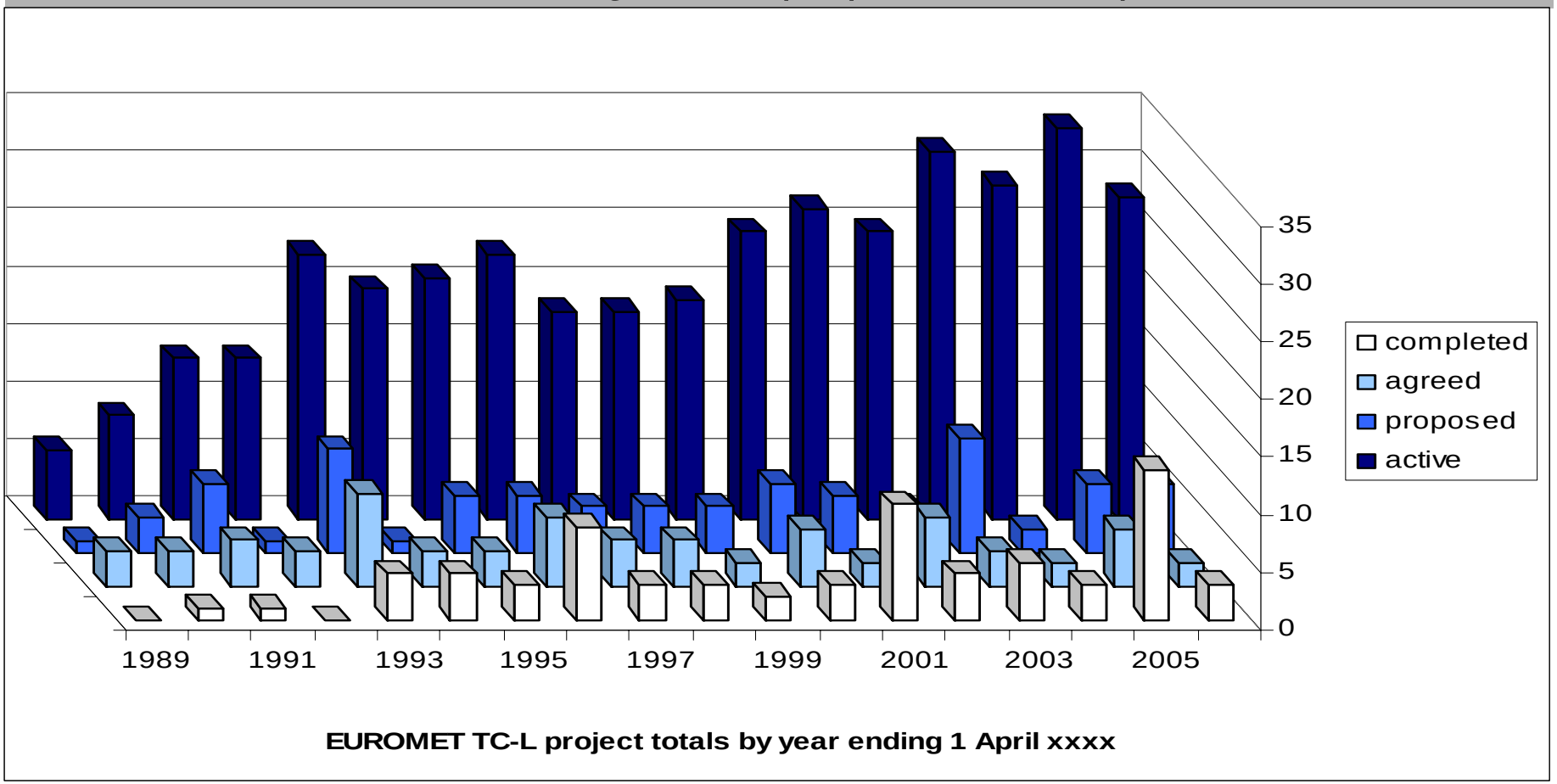
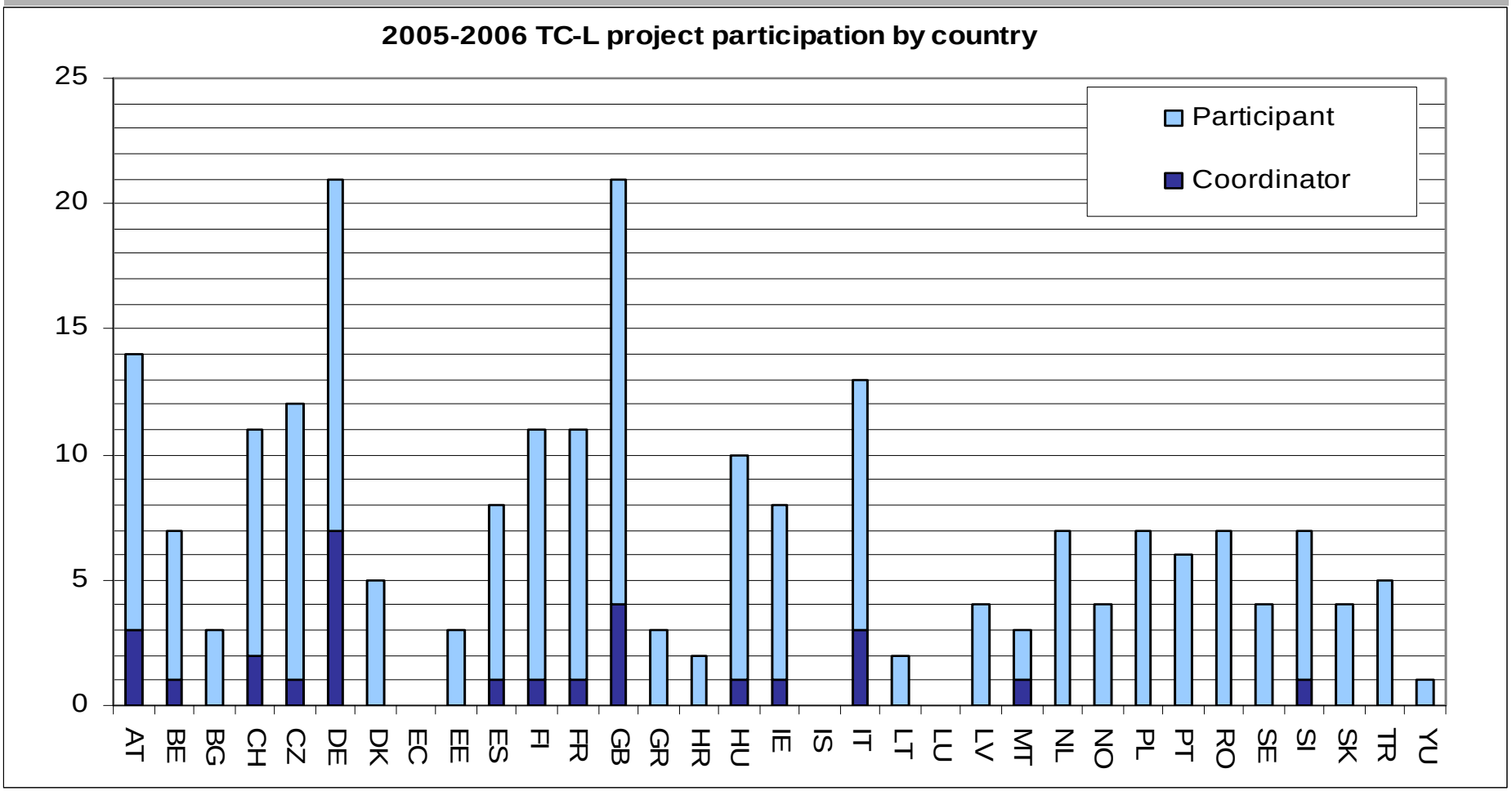
Yearly TC-L project statistics
01 April – 01 April

28 active projects (14 comp, 1 cons, 8 coop, 5 traceability)
Changes: 2 agreed, 6 proposed, 3 completed

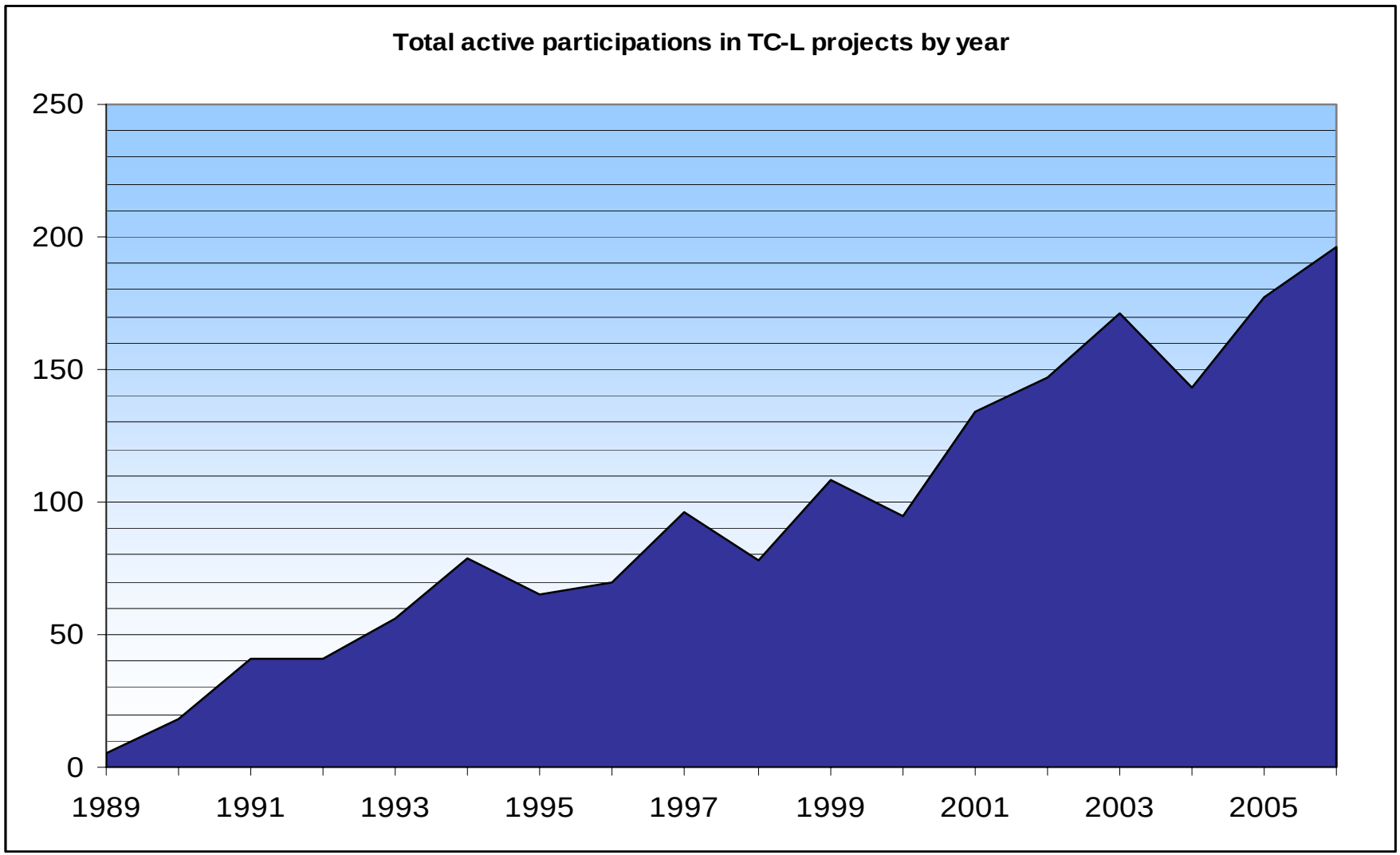


Participation in TC-L projects 2005.04.01 – 2006.04.01

196 participations overall, 14 different coordinating NMIs



Participation totals year by year



CCL key comparisons

Number	Subject	Status	Report
CCL-K1	Gauge blocks	Complete	Metrologia paper
CCL-K3	Polygons	Complete	Draft A
CCL-K4	Ring & Plug gauges(a:internal, b:external)	Complete	Draft - B2
CCL-K5	1D CMM artefacts	Complete	Draft - B4a
CCL-K7	**Linescales**		
CCL-K8	**Surface texture**		

- First (and only) round of CCL key comparisons
- Started planning 1997
- Circulations completed 2004
- Reports complete 2006-2007
- Topics revised for future use as CCL-RMO key comparisons

EUROMET key comparisons

Number	Subject	Project no.	Report/status
EUROMET.L-K1	Gauge blocks	471	Final report
EUROMET.L-K1.1	Gauge blocks	643	Final report
EUROMET.L-K2	Long gauge blocks/length bars	602	Final report
EUROMET.L-K3.2006	Angle	---	Consider in 2006
EUROMET.L-K4.2005	Diameter	812	**Running**
EUROMET.L-K5.2004	1D CMM artefacts	777	**Running**
EUROMET.L-K6	2D CMM artefacts	743	**Running**
EUROMET.L-K7.2006	Linescales (up to 100 mm)	882	Planning
EUROMET-S.14	**Steel tapes (K7)**	**677**	**Final Report**
EUROMET-S.11	**Surface texture (K8)**	**600**	**Final Report**

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CCL NANO studies

Number	Subject	Status	Report
NANO1	Linewidth	Starts in 2007	-
NANO2 (CCL-S2)	Step height	Complete	Final report
NANO3 (CCL-S3)	Linescales	Complete	Final report
NANO4 (CCL-S1)	1D gratings	Complete	Final report
NANO5	2D gratings	**Running**	-

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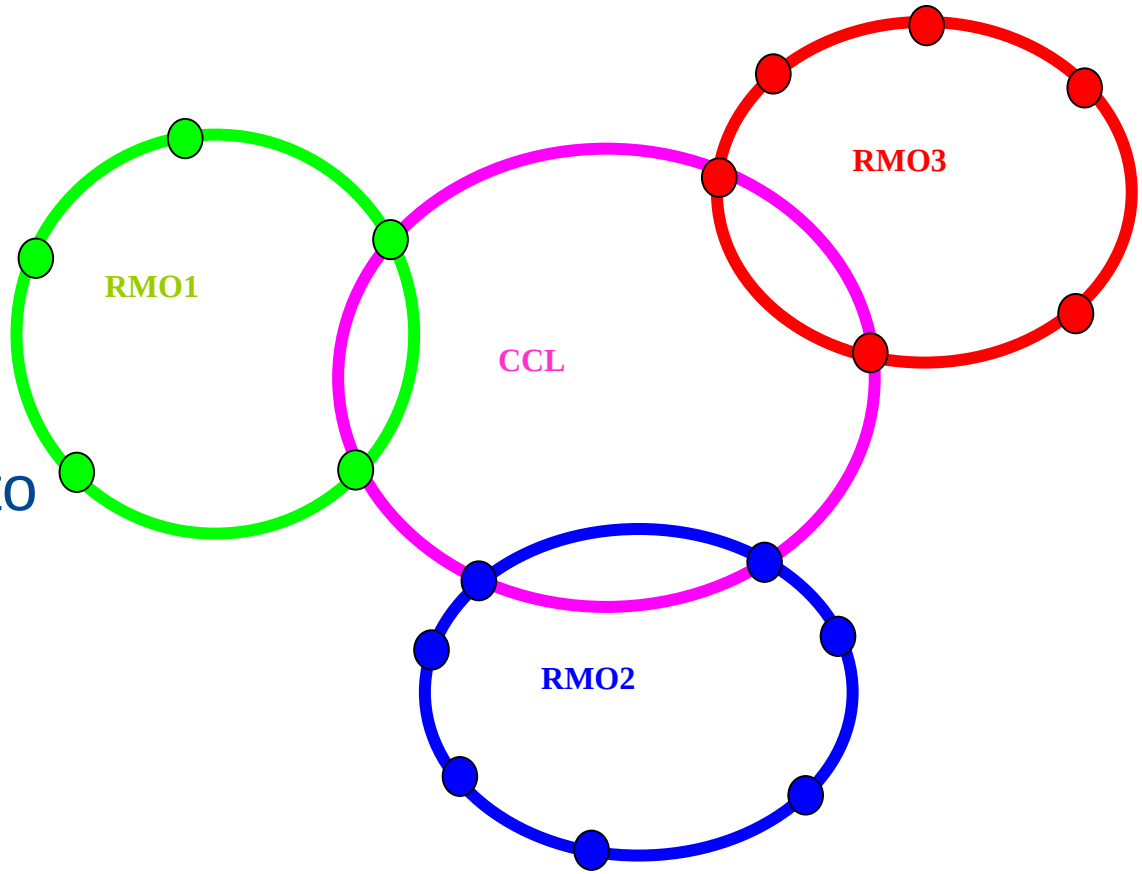
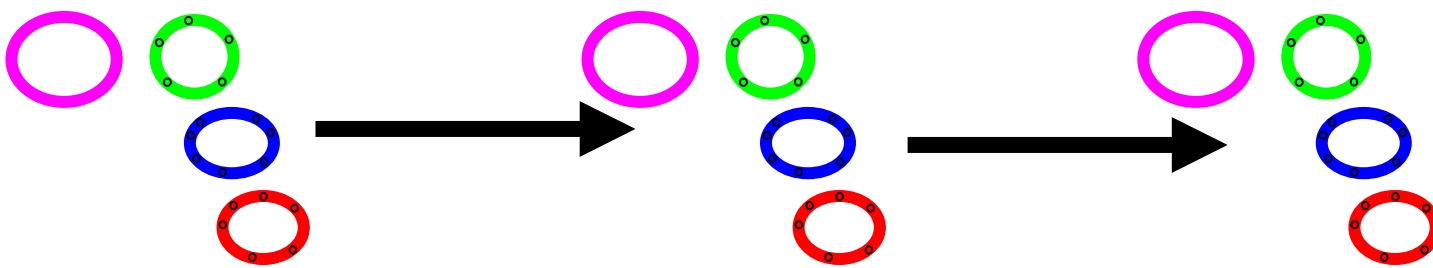
Comparison linking: idealised

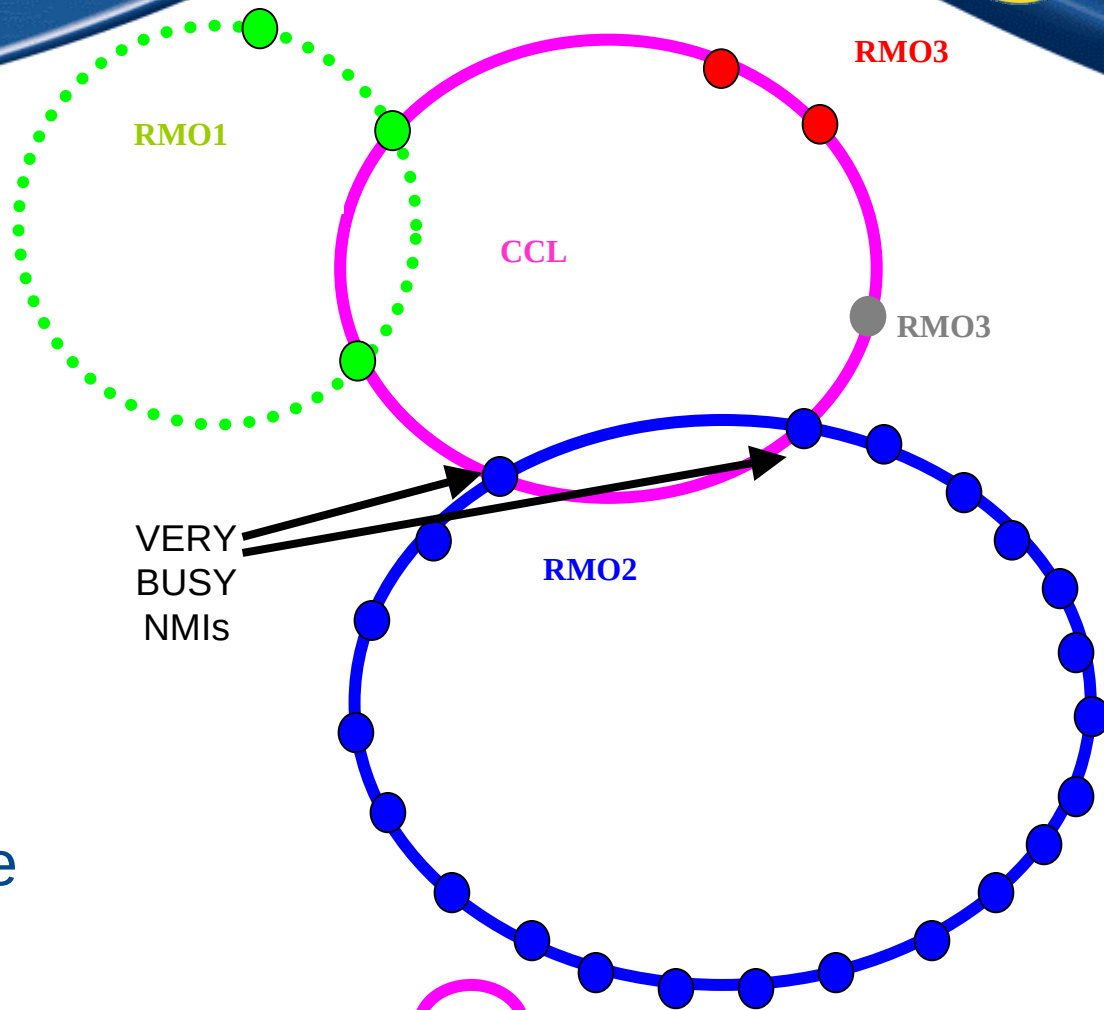
- CCL loop
- RMO loops
- CCL labs in the RMO loops
- CCL KCRV input into the RMO KCs
- Short timescale
- Repeated cycle

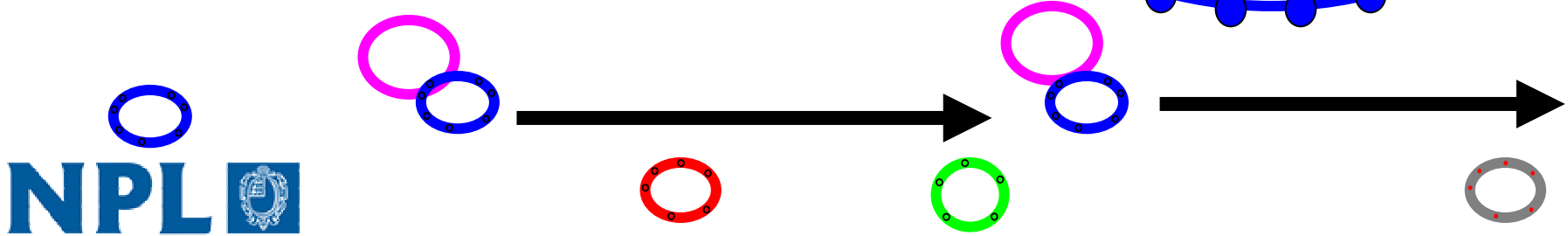




Comparison linking: in practice

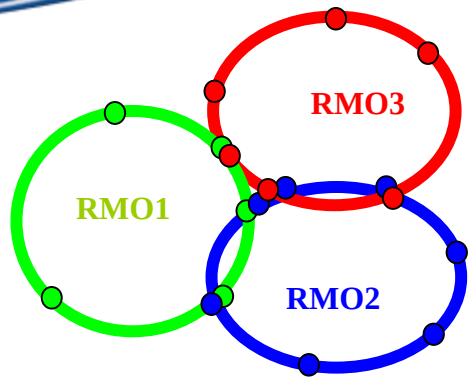
- CCL loop
- Some RMO loops
- Some RMO delays
- Artefact dependent offsets/uncertainties
- ⇒Separate KCRVs
- Long timescale
- Cycle time > repeat time





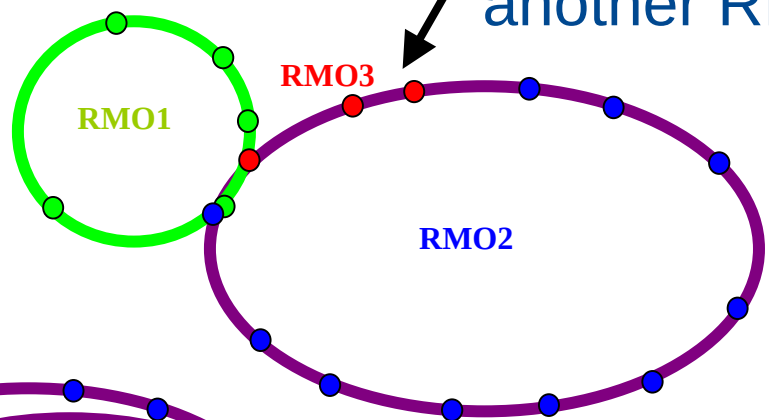
Comparison linking: pragmatic approach

Inter-RMO linking, but with time-phased loops

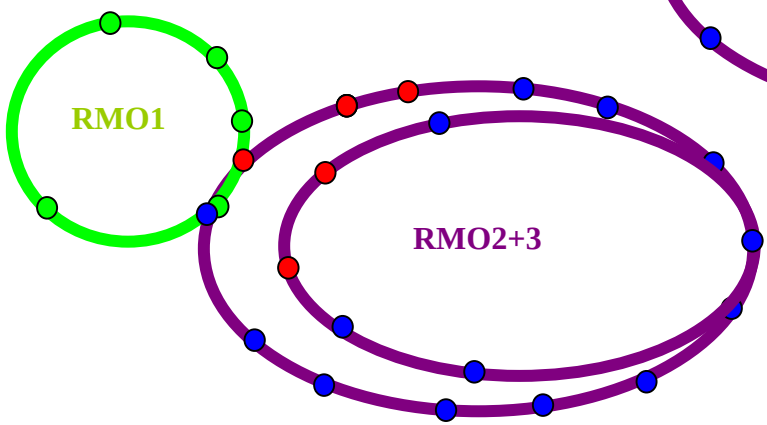


Inter-RMO linking without CCL loop

NMIs from another RMO



RMO comparison with multiple loops



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New style of key comparisons: 'CCL-RMO key comparison'

- EUROMET.L-K5.2004 (step gauges) – running
  AT, CZ, DK, ES, FI, FR, GB, HU, IE, IT, NL, PL, PT, RO, SE,
  AU, BR, CA, RU, ZA (CH and DE join APMP)
- EUROMET.L-K4.2005 (diameter) – running
  AT, BE, CH, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IT, LV, NL, PL, RO, SE, SI, TR,
  BR, CA, IL (no suitable comparison available outside EUROMET)
- EUROMET.L-K7.2006 (short linescales) – planning
  AT, BE, BG, CH, CZ, DE, ES, FI, GB, GR, HR, HU, IE, IT, LV, NL, NO, PL, RO, SI, SK, YU
  BR, CA, CN, MX, RU, SG, UA, US
- EUROMET.L-K3.2006 (angle) - waiting

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EUROMET length CMC submissions

Designation	Comment	EUROMET review date	Status
EUROMET.L.1.2000	Initial top level service submission from most of EUROMET NMIs.	2000	Complete - on KCDB, 2001
EUROMET.L.1.2001	Full submission, almost all services, most EUROMET NMIs, update on .L.1.2000 .	2001	Complete - on KCDB, 2001-10-30
EUROMET.L.2.2002	Minor updates/submissions from GB and FI.	Jun 02	Complete - on KCDB, 2003-01-09
EUROMET.L.3.2004	Submissions from AT, CH, CZ, DE, HU, IT, NO. Also first submission from BG, LT, LV, RO, SI, YU.	Jul 03 - Jun 04	Complete - on KCDB, 2005-03-23
EUROMET.L.4.2006	24 minor updates and 35 new submissions.	May 05 - Jan 06	Complete - on KCDB, 2005-05-10

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Other RMO length CMC submissions

Designation	Comment	EUROMET review date	Status
SADCMET.L.1.2001	First main submission from SADCMET.	N/A	Abandoned
COOMET.L.1.2002	First main submission from COOMET. Re-examined in early 2004.	Oct 02 - Dec 03 and Jan-Mar 04	Complete - on KCDB, 2004-04-06
APMP.L.1.2003	MY, TW submissions. Reviewed by EUROMET TCL Chairman.	Nov 03 - Dec 03	Complete - on KCDB, 2004-02-19
SIM.L.1.2003	Major submission from NIST. Reviewed by EUROMET TCL Chairman.	Sep 03 - Nov 03	Complete - on KCDB, 2004-01-15
SIM.L.2.2003	Submissions from BR, MX, USA.	Dec 03 - Feb 04	Complete - on KCDB, 2004-06-15
COOMET.L.2.2004	Second main submission from COOMET. Ukraine. (Belarus temporarily removed).	Jan 04 - Apr 04	Complete - on KCDB, 2005-01-10
APMP.L.2.2004	Major submission from JP. Review by EUROMET TCL Chairman.	May 04 - May 04 and Mar 05	Complete - on KCDB, 2005-05-25
COOMET.L.3.2005	Next main submission from COOMET. Belarus (was part of COOMET.L.2.2004).	Mar 05	Complete - on KCDB, 2005-06-17
APMP.L.3.2006	23 new CMCs from NPL-India	Feb 06	Undergoing inter-RMO review

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2005 TC-L Contact persons meeting

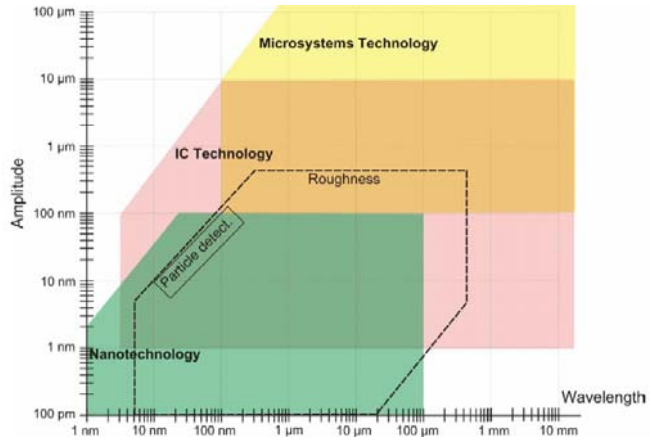
31 participants

26 countries

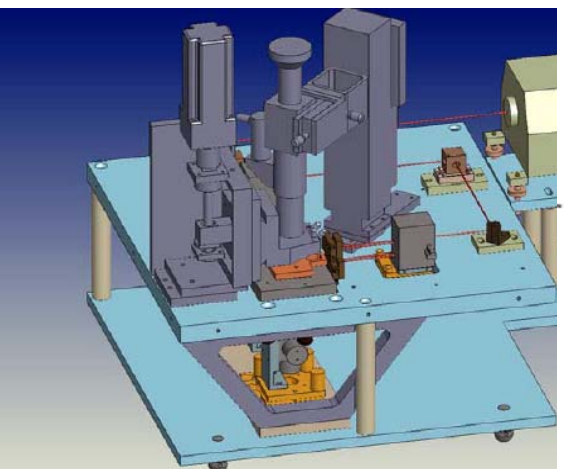
EUROMET TC-Length Meeting 2005, INM, Bucharest

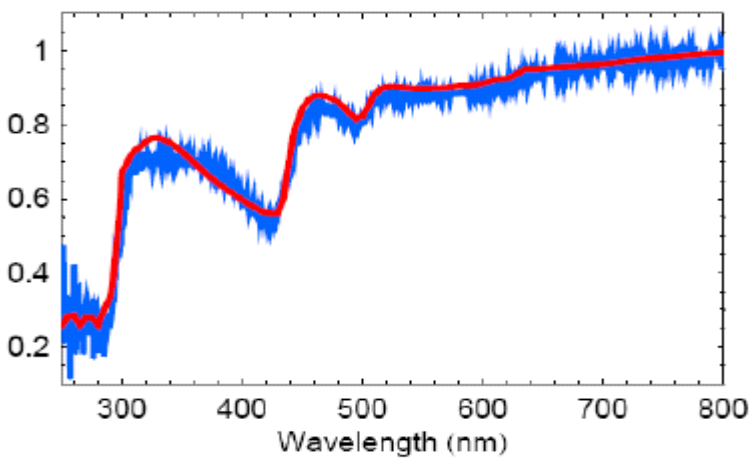
2006 TC-L Contact persons meeting: ‘Nanotrends’ workshop

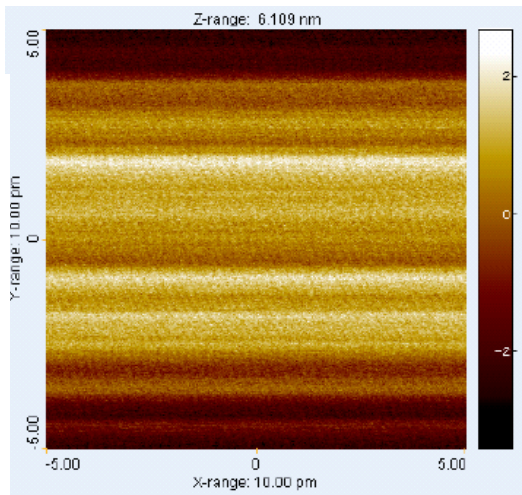
- ‘Recent advances & news’
- Two half day sessions
- 9 presentations (NMIJ keynote):
  - Progress at NMIs
  - Optical methods
  - Mechanical methods
  - Standardisation issues



$$z(x,\boldsymbol{a}) = h_0 C\left(W(x)\right) = \begin{cases} h_0 \tanh\left(\gamma\left(1 - W_0 \sin^2\left(\pi \frac{x}{\Lambda}\right)\right)\right) \\ 0 \end{cases}$$







2006 TC-L Contact persons meeting

- TC-L meeting 2006 to be hosted by Croatia
- 2 – 4 October 2006, Zagreb
- 1.5 day meeting
- 2 x 1/2 day workshop - probably

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iMERA roadmapping in TC-L

- Group of 8 contact persons (GB, CH, IT, AT, FR, DE, FI,NL)
- Brainstorming meeting, NPL 31 Jan – 1 Feb
- 3 roadmaps – became 4
  - Support for advanced manufacturing
  - Micro and nano technologies
  - Large scale
  - Support for fundamental R&D

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End