Cable Current Measurements – Cat6a

Bill Delveaux
Cisco Systems
bdelveau@cisco.com

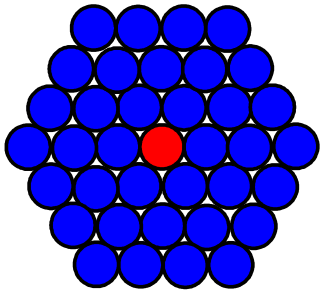
Ronald Nordin
Panduit
rano@panduit.com

Testing

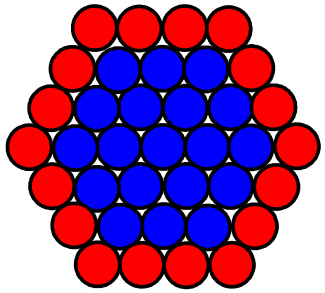
- **The heating was done under two– and four–pair current loading with 420 mA per conductor.**
- **Measurement objective was the equilibrium temperature difference of the resulting operating temperatures of the conductors and the ambient temperature.**
- **The following configurations with of the heated cables in the bundle were used:**

Configurations

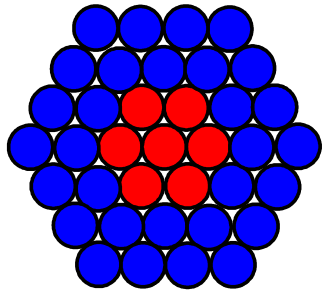
1st Trial



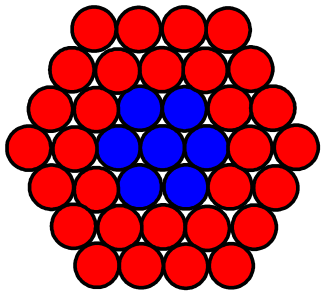
4th Trial



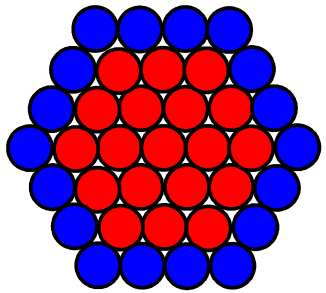
5th Trial



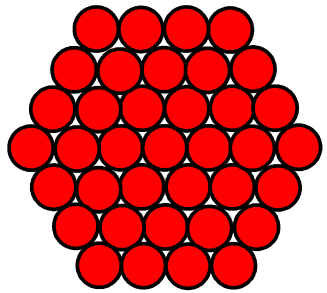
The heated cables are indicated in red. Temperature in the centre cable and in each layer on the main diagonal of the hexagon are measured



10th Trial



11th Trial



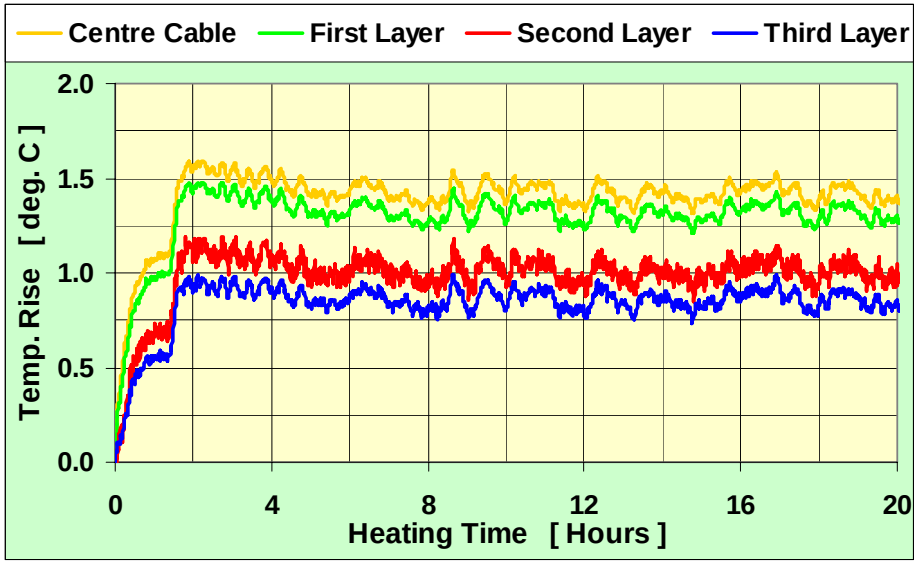
15th Trial

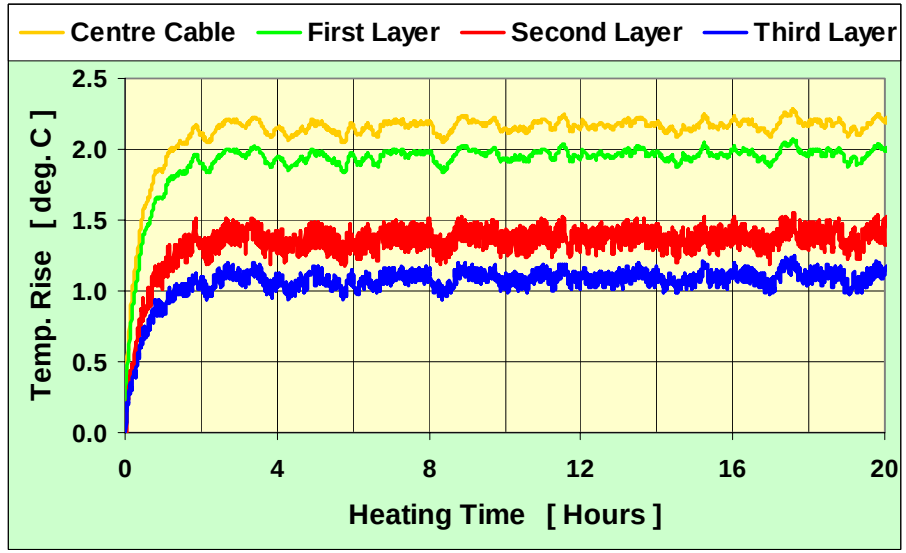
- **The numbers of the trials refer to the configuration described in the test procedure.**

Cat 6a - Cable Characteristics

Pair #	Solid Cable		
	LR (ohms)	CRU %	CMCRU %
1	13.7	0.4	-
1 – 2			1.793
1 – 3			0.001
1 – 4			1.084
2 – 1			1.793
2	14.2	0.1	-
2 – 3			1.792
2 – 4			0.709
3 – 1			0.001
3 – 2			1.792
3	13.7	0.1	-
3 – 4			1.083
4 – 1			1.084
4 – 2			0.709
4 – 3			1.083
4	14.0	0.1	-

Results – 2-pair/4-pair trial 5

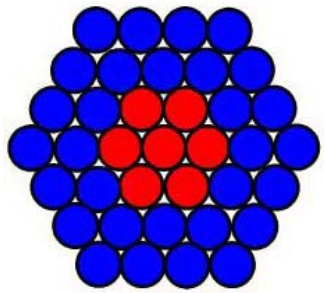




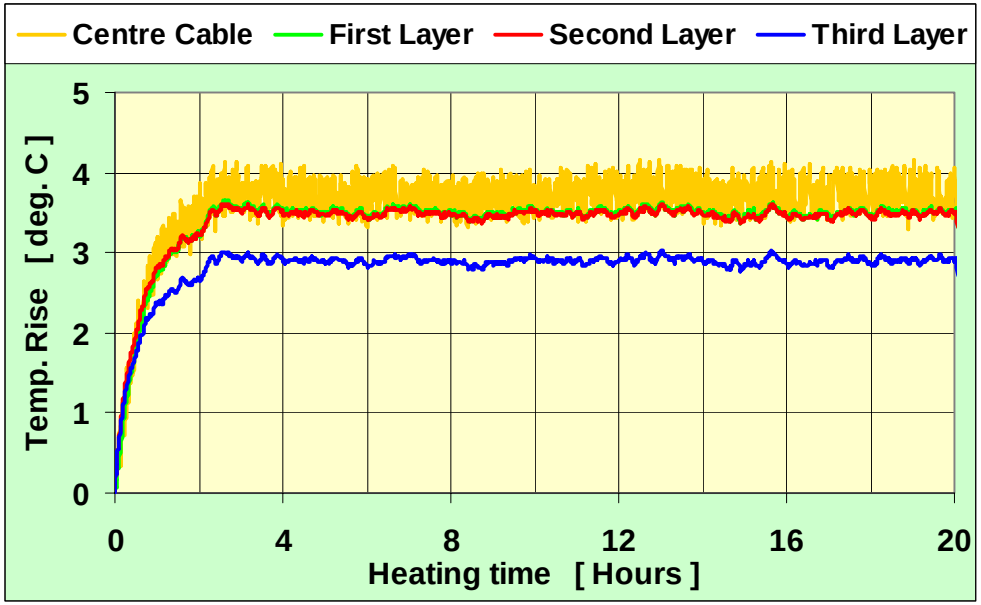
2-pair

Trial configuration

4-pair

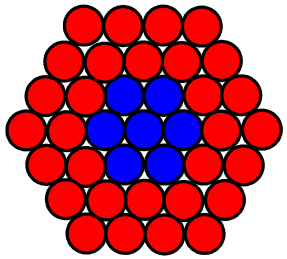


Results – 4-pair trial 10

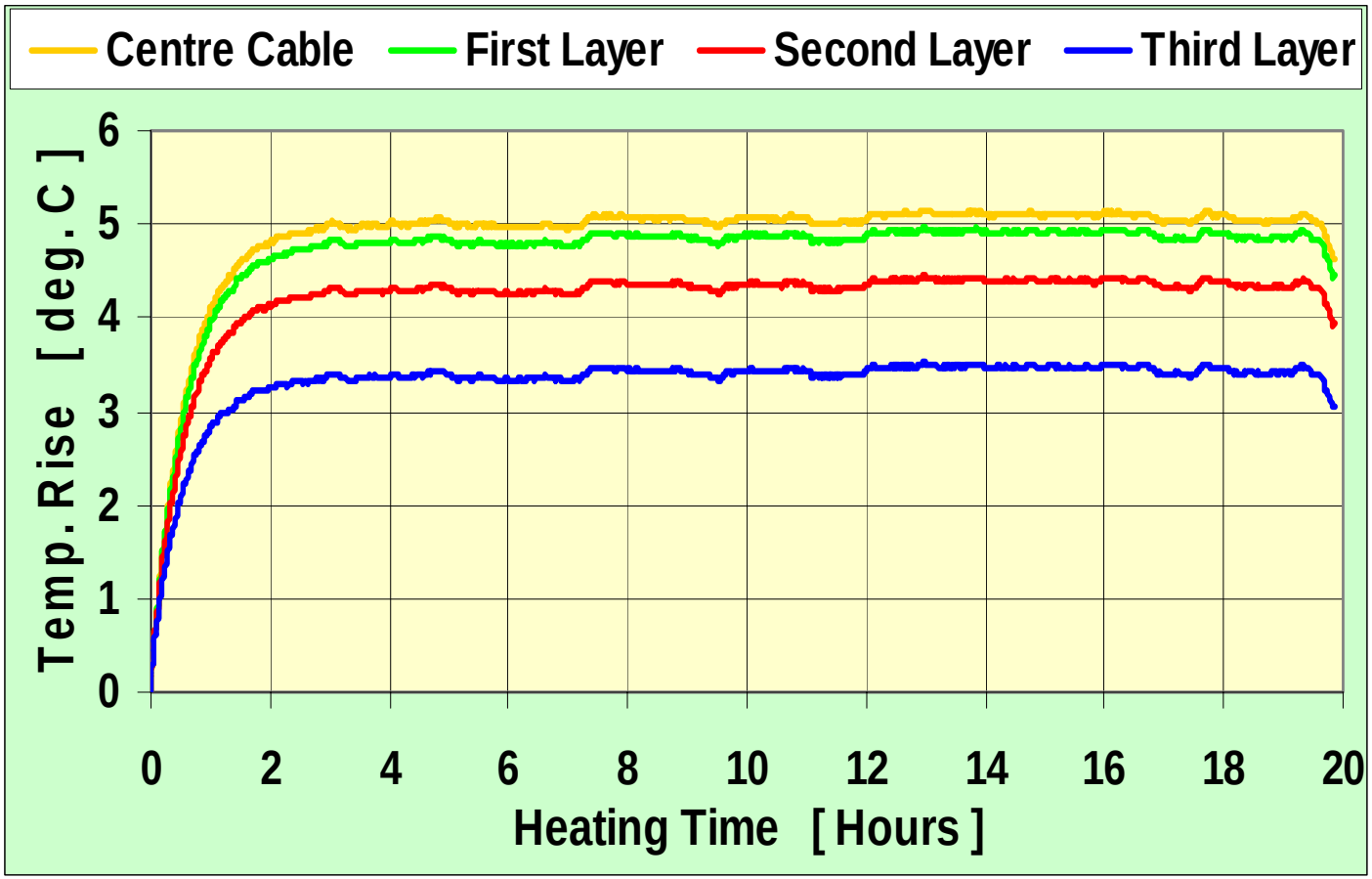


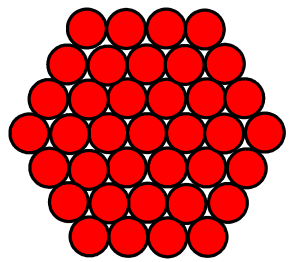
Trial configuration

4-pair



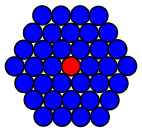
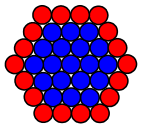
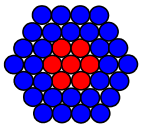
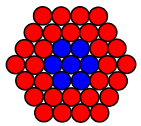
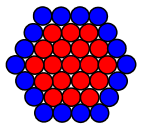
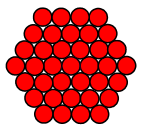
Results – 4-pair trial 15





Cat 6a

Temperature rise – Cat 6a cable

Results on the solid (horizontal) cable					
Trial #	LAYER	Temperature Rise over Ambient [deg. C]			
		2 Pair Heating		4 Pair Heating	
		Mean	Error	Mean	Error
	Centre Cable	0.89	0.03	1.16	0.04
	First Layer	0.86	0.02	0.93	0.03
	Second Layer	0.77	0.02	0.87	0.03
	Third Layer	0.69	0.02	0.80	0.03
	Centre Cable	-	-	2.01	0.07
	First Layer	-	-	2.10	0.07
	Second Layer	-	-	2.08	0.07
	Third Layer	-	-	2.06	0.07
	Centre Cable	0.85	0.03	2.17	0.07
	First Layer	0.79	0.02	1.96	0.06
	Second Layer	0.61	0.02	1.37	0.05
	Third Layer	0.52	0.02	1.09	0.04
	Centre Cable	-	-	3.72	0.12
	First Layer	-	-	3.51	0.11
	Second Layer	-	-	3.48	0.11
	Third Layer	-	-	2.90	0.09
	Centre Cable	2.24	0.07	2.89	0.10
	First Layer	2.14	0.07	2.74	0.09
	Second Layer	1.89	0.06	2.32	0.08
	Third Layer	1.44	0.05	1.62	0.05
	Centre Cable	3.01	0.10	5.06	0.17
	First Layer	2.91	0.10	4.87	0.16
	Second Layer	2.65	0.09	4.35	0.15
	Third Layer	2.19	0.08	3.43	0.11

- **Average values over 10 hours minimium**
- **Results of the equilibrium temperature rise over ambient of the horizontal cable.**

Moving Forward

- **Determine for a cable type the temperature difference between operating and ambient temperature as a function of the current. This is a parabolic function, hence a linear relationship in a log–log plot.**
- **Establish a graph for the de-rating factor as a function of the number of cables in the bundle.**
- **Establish a graph for the de-rating factor as a function of the number of conductors used in the cable in the bundle.**

Questions …

… or comments