UPOV
International Union for the Protection of New Varieties of Plants

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A NEW PERSPECTIVE ON THE DUS TEST OF EGGPLANT FRUIT COLOR BASED ON LAB COLOR PARAMETERS

Document prepared by an expert from China

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The annex to this document contains a copy of a presentation “A new perspective on the DUS test of eggplant fruit color based on Lab color parameters”, to be made by an expert from China, at the third session of the TWM.

[Annex follows]

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SHANGHAI ACADEMY OF AGRICULTURAL SCIENCES

A new perspective on the DUS test of eggplant fruit color based on *L*a*b** color parameters

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TG/117/4

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS | UNION INTERNATIONALE POUR LA PROTECTION DES OBTENTIONS VÉGÉTALES | INTERNATIONALER VERBAND ZUM SCHUTZ VON PFLANZEN-ZÜCHTUNGEN | UNIÓN INTERNACIONAL PARA LA PROTECCIÓN DE LAS OBTENCIONES VEGETALES

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

EGG PLANT

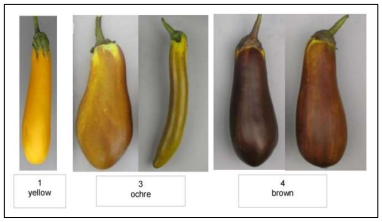
(*Solanum melongena* L.)

GENEVA

2002

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
24 (*)	VG	**Fruit: main color of skin at harvest maturity**				
PQ		white		Dourga	Koshienzairai	1
QL		green		Kermit	Shironasu	2
G		violet		Baluroi, Purpura		3

		English	UPOV Example Varieties	Netherlands Example Varieties	Japan Example Varieties	Note
41	VG	**Fruit: color of skin at physiological ripeness**				
PQ		yellow		Dourga		1
G		orange		Compridо Verde Claro		2
		ochre		Adria, Vernal		3
		brown		Baluroi, Abrivado		4
		red				5
		purple				6
		others				7



Fruit skin main color at physiological ripeness

Fruit skin main color at harvest maturity

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Fruit color of eggplant DUS test in China


GB

中华人民共和国国家标准

GB/T 19557.20—2017

植物品种特异性、
一致性和稳定性测试指南　茄子

Guidelines for the conduct of tests for distinctness, uniformity and stability—
Eggplant(*Solanum melongena* L.)

2017-11-01 发布　　2018-05-01 实施

中华人民共和国国家质量监督检验检疫总局
中国国家标准化管理委员会　发布

Fruit skin main color at harvest maturity

32	* 果实：果皮颜色 PQ (b) (+)	07 VG	白色	White	1
			绿色	Green	2
			紫色	Purple	3

Fruit skin color at physiological ripeness

37	果实：生理成熟果皮色 PQ (b)	08 VG	黄色	Yellow	1
			红色	Red	2
			褐色	Brown	3


B.3.13　性状 32　* 果实：果皮颜色

* 果实：果皮颜色，见图 B.8。

1 白色 White　2 绿色 Green　3 紫色 Purple

图 B.8　* 果实：果皮颜色

Red

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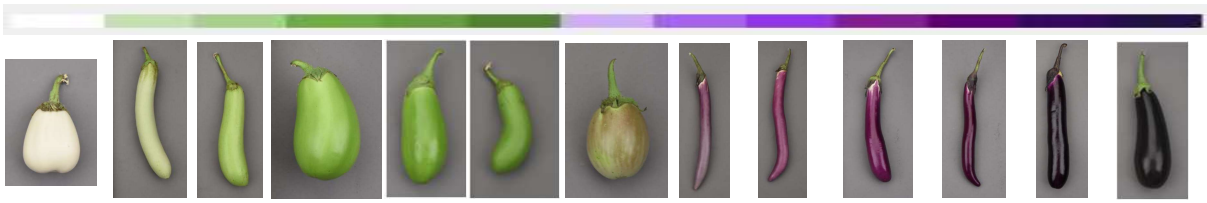
Fruit skin main color and fruit pulp color

harvest maturity



1 White	2 Green	3 Purple/Violet

physiological ripeness

1 Yellow	2 Ochre	3 Brown

Fruit pulp color

1 White	2 Green

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PART 02

Color characteristics of eggplant fruits as revealed by color parameters

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Measurement and definition of color parameters

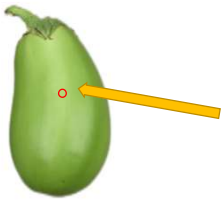

Table 1 The detailed descriptions of color parameters used for the classification

Parameters	Formula for calculation	Results		Ranges
		+	−	
L^* (ΔL^*)	L^* (sample)–L^* (standard)	Lighter	Darker	$-100 \le \Delta L^* \le 100$
a^* (Δa^*)	a^* (sample)–a^* (standard)	Redder	Greener	$-100 \le \Delta a^* \le 100$
b^* (Δb^*)	b^* (sample)–b^* (standard)	Yellower	Bluer	$-100 \le \Delta b^* \le 100$
C^* (ΔC^*)	$(\Delta a^2 + \Delta b^2)^{1/2}$	Brighter	Duller	$\Delta C^* \ge 0$
H^* (ΔH^*)	$\tan^{-1}(\Delta b^*/\Delta a^*)$	All positive, the difference in hue		$0 \le \Delta H^* \le 270$
E^* (ΔE^*)	$[\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2}]^{1/2}$	All positive, the total color difference		$E^* \ge 0$

During the measurement, primary value of color parameters (standard) are uniformly set to 0, so the final value of ΔL^*, Δa^*, Δb^*, ΔC^*, ΔH^* and ΔE^* can be recorded simply as L^*, a^*, b^*, C^*, H^* and E^*

Youxia Shan, Chaojun Deng, Wenshun Hu, Junwei Chen, Xiuping Chen, Shaoquan Zheng. Qiaoping Qin. First insight into diversity of leaf color of loquat (*Eriobotrya*) and its potential value on taxonomy. Genet Resour Crop Evol (2019) 66:143–163.

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The spatial distribution on L*, a*, b* value of the eggplant fruit color

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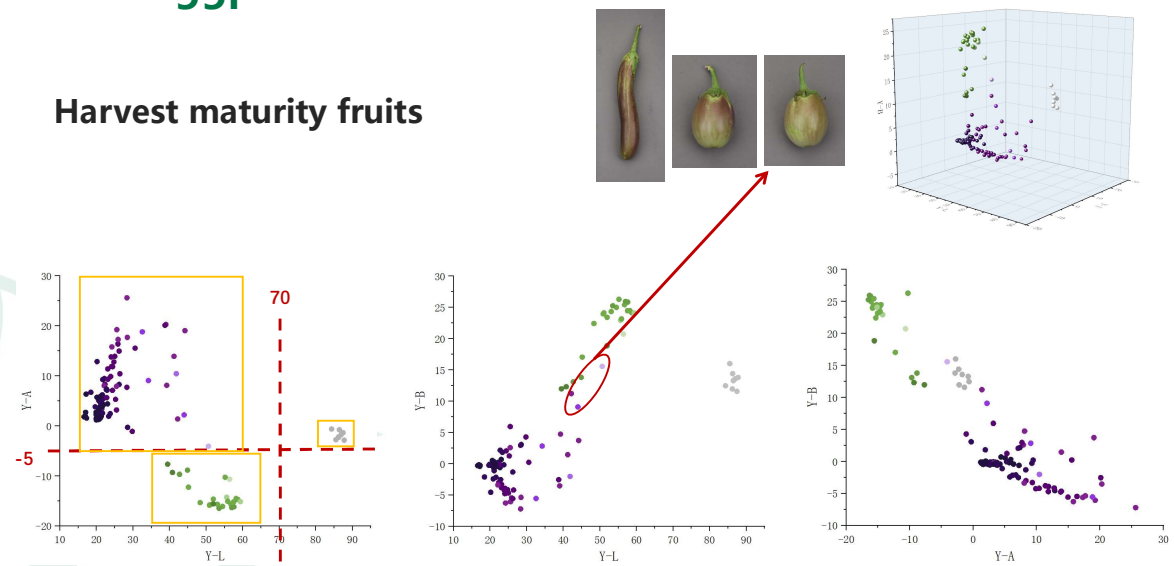
Harvest maturity fruits



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The spatial distribution on L*, a*, b* value of the eggplant fruit color

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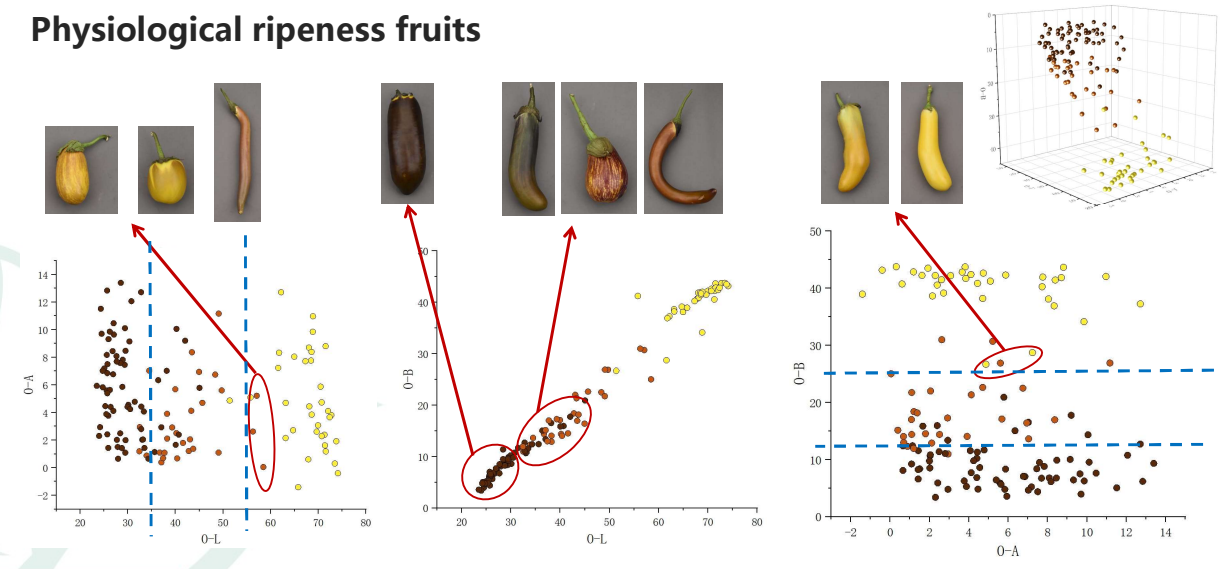
Physiological ripeness fruits



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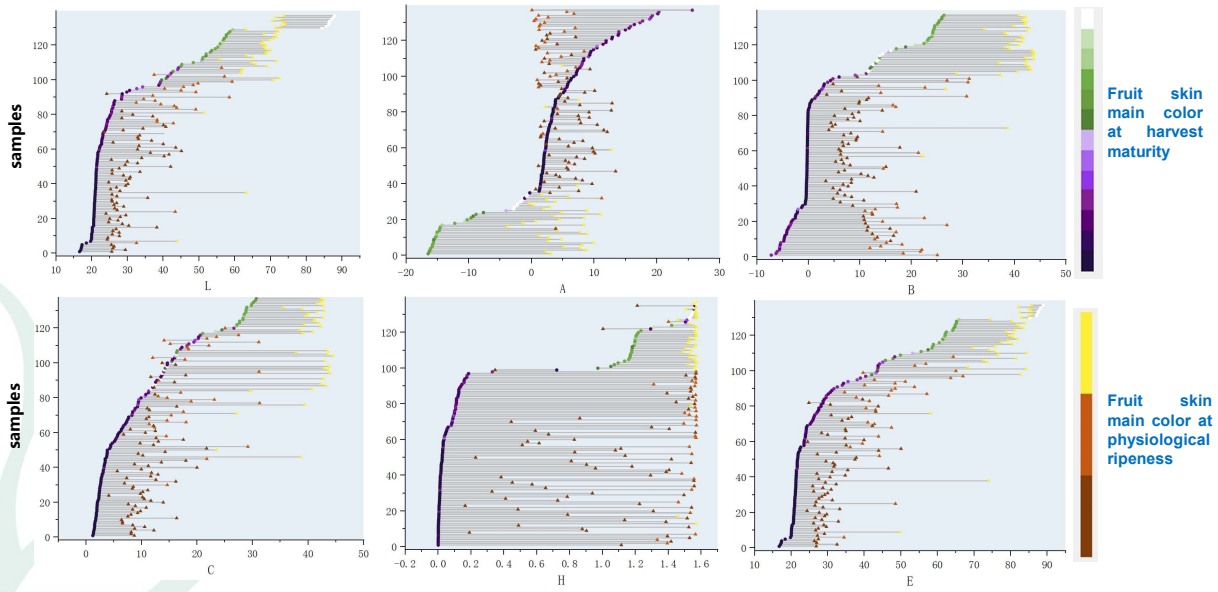
Spatial and temporal change traits of eggplant fruit coloration



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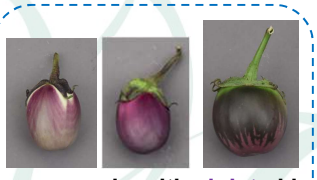
The different of the eggplant fruit color

green pulp with red skin (G+R)



green pulp with violet skin (G+V)

white pulp with red skin (W+R)

white pulp with violet skin (W+V)

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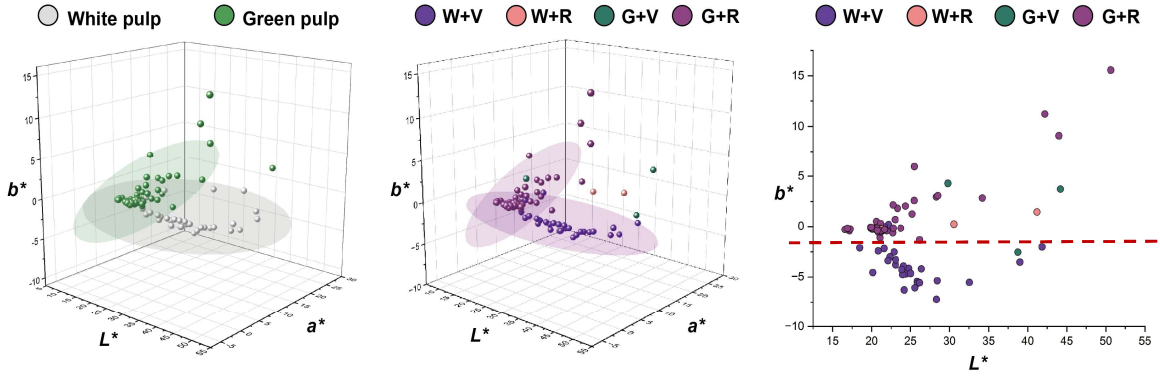
The effact of purple fruit color by pulp and skin color



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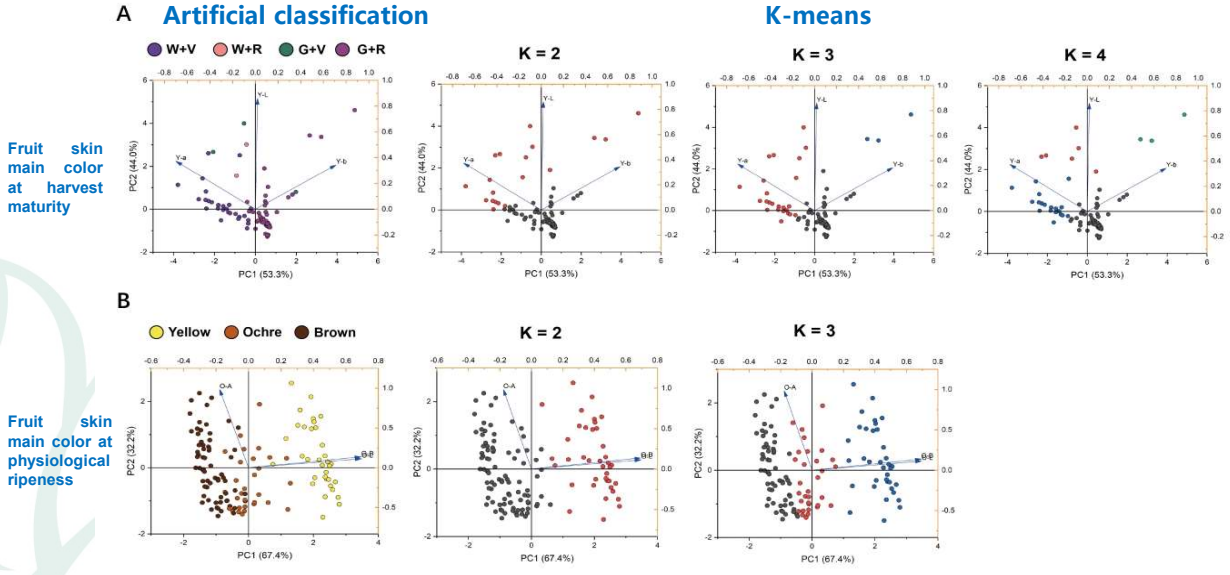
The classification of purple eggplant in LAB values



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Various types of eggplant skin color range and visualization

White (L: 80~90; a: -5~0; b: 10~17.5)
Green (L: 35~65; a: -20~-5; b: 10~27.5)
Purple (L: 15~60; a: -5~30; b: -10~15)
Violet (L: 15~45; a: 5~27.5; b: -10~-2.5)
Red (L: 15~60; a: -5~20; b: -2.5~15)
Yellow (L: 60~75; b: 32~45)
Ochre (L: 35~55; b: 12~25)
Brown (L: 23~35; b: 3~12)

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PART 03

A new perspective on the subdivision of eggplant fruit color based on color parameters

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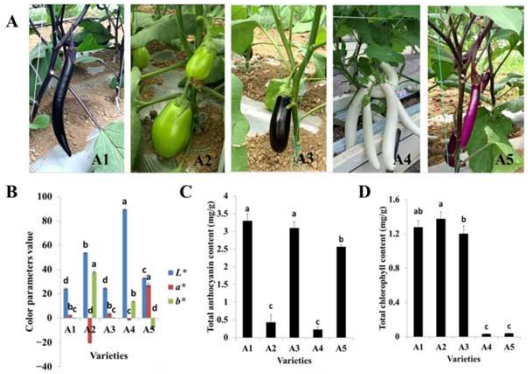
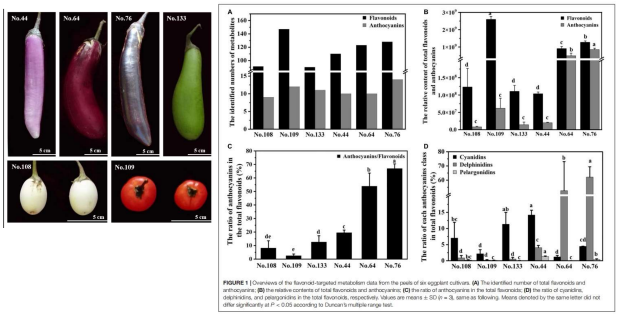
Studies on chlorophyll and anthocyanins in eggplant fruits



Zhou, X.; Liu, S.; Yang, Y.; Liu, J.; Zhuang, Y. Integrated Metabolome and Transcriptome Analysis Reveals a Regulatory Network of Fruit Peel Pigmentation in Eggplant (*Solanum melongena* L.). *Int. J. Mol. Sci.* 2022, *23*, 13475.



Yang G, Li L, Wei M, Li J and Yang F (2022). SmMYB113 Is a Key Transcription Factor Responsible for Compositional Variation of Anthocyanin and Color Diversity Among Eggplant Peels. Front. Plant Sci. 13:843996.

Differences in fruit color metabolism and chlorophyll content between "purple-skinned" and "red-skinned" eggplants. Different percentages of anthocyanin and delphinidin content in eggplant lead to different purple coloration.

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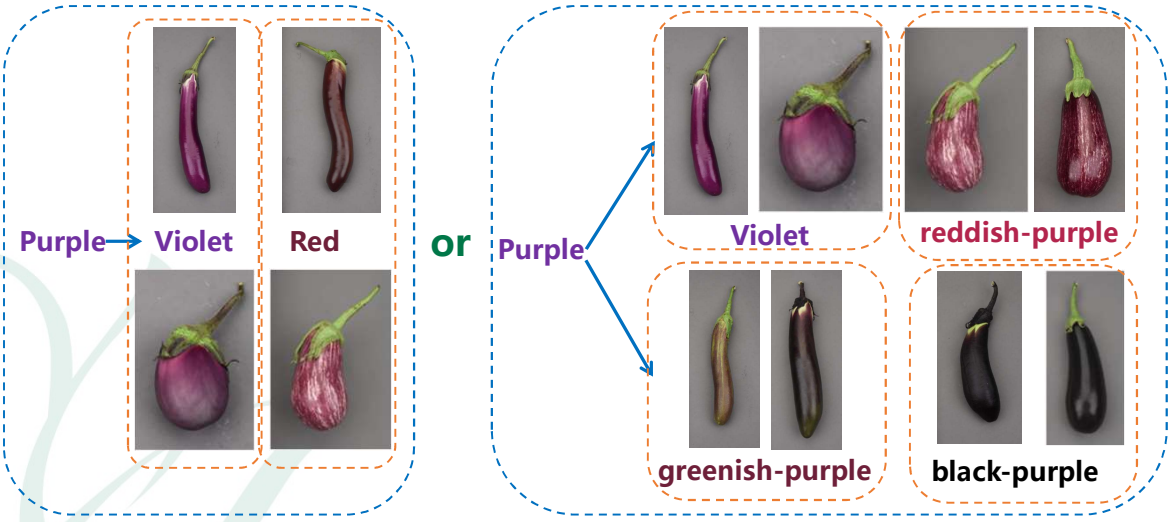
The subdivision of the expression status of the eggplant fruit skin color



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Conclusion

- The ranges of eggplant fruit skin color types at harvest maturity and physiological ripeness based on the *L**, *a**, *b** values of color parameters was performed, and the data support was provided for subdividing the color system of purple fruit.
- Compared with the observation of the naked eye, the color parameter is more accurate in determining the color, correcting the ambiguity and error of sensory judgment, especially in the judgment of adjacent colors.
- Development of gradient color blocks based on *L**, *a**, *b** thresholds, enabling standardized digital documentation of color traits for breeding and intellectual property protection.

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THANK YOU FOR WATCHING

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[End of Annex and of document]