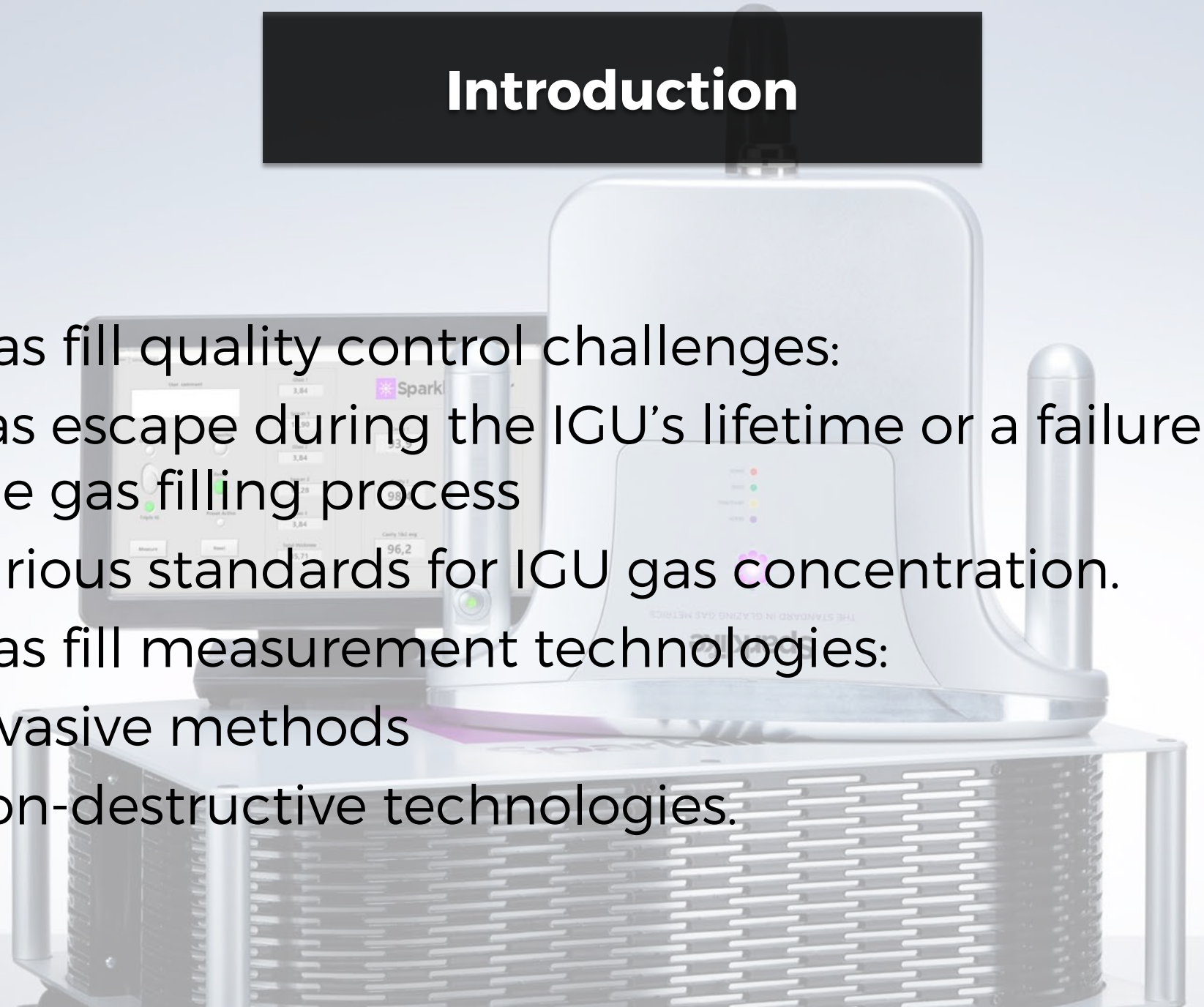
Sparklike®

INDEPENDENT TESTING OF SPARKLIKE LASER™

NON-DESTRUCTIVE IG GAS ANALYSER

Introduction



- IG gas fill quality control challenges:
  - gas escape during the IGU's lifetime or a failure during the gas filling process
  - various standards for IGU gas concentration.
- IG gas fill measurement technologies:
  - invasive methods
  - non-destructive technologies.

Sparklike

Introduction

- Sparklike Laser™ allows non-destructive measurement of IG gas concentration on triple and double IGU's, through most coated and laminated glasses.
- Sparklike requested two testing laboratories to determine the argon gas concentration in particularly challenging IGU's with various coating types.
- **The purpose of the test:** verify the results from measurements done with Sparklike Laser™ by using gas chromatographs (GC) as reference devices.

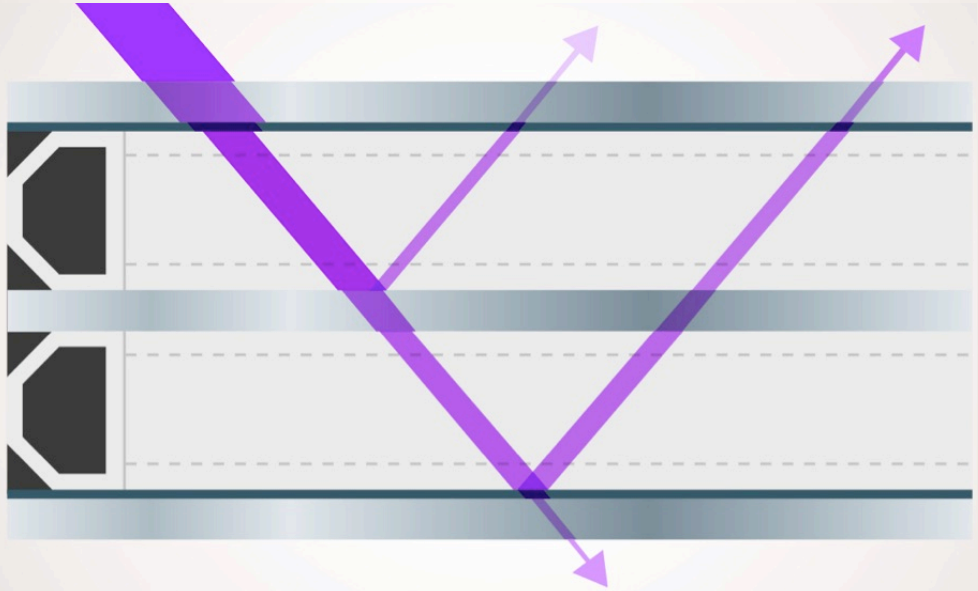
Sparklike

Description of the test equipment: Sparklike Laser™

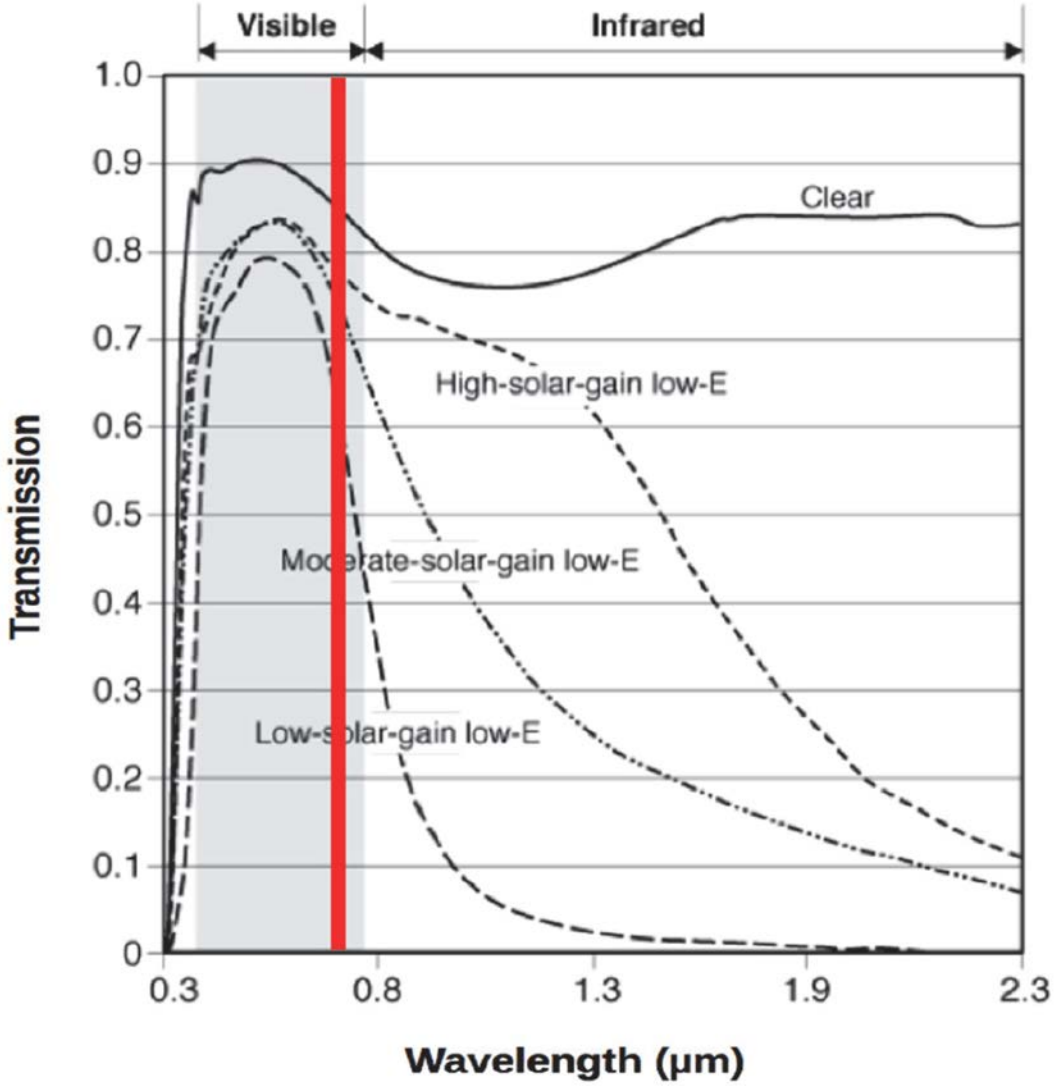
- Sparklike Laser™ devices are based on TDLAS technology.
- The device measures oxygen and converts the results to insulating gas.

Description of the test equipment: Sparklike Laser™

- How laser measures IGU:



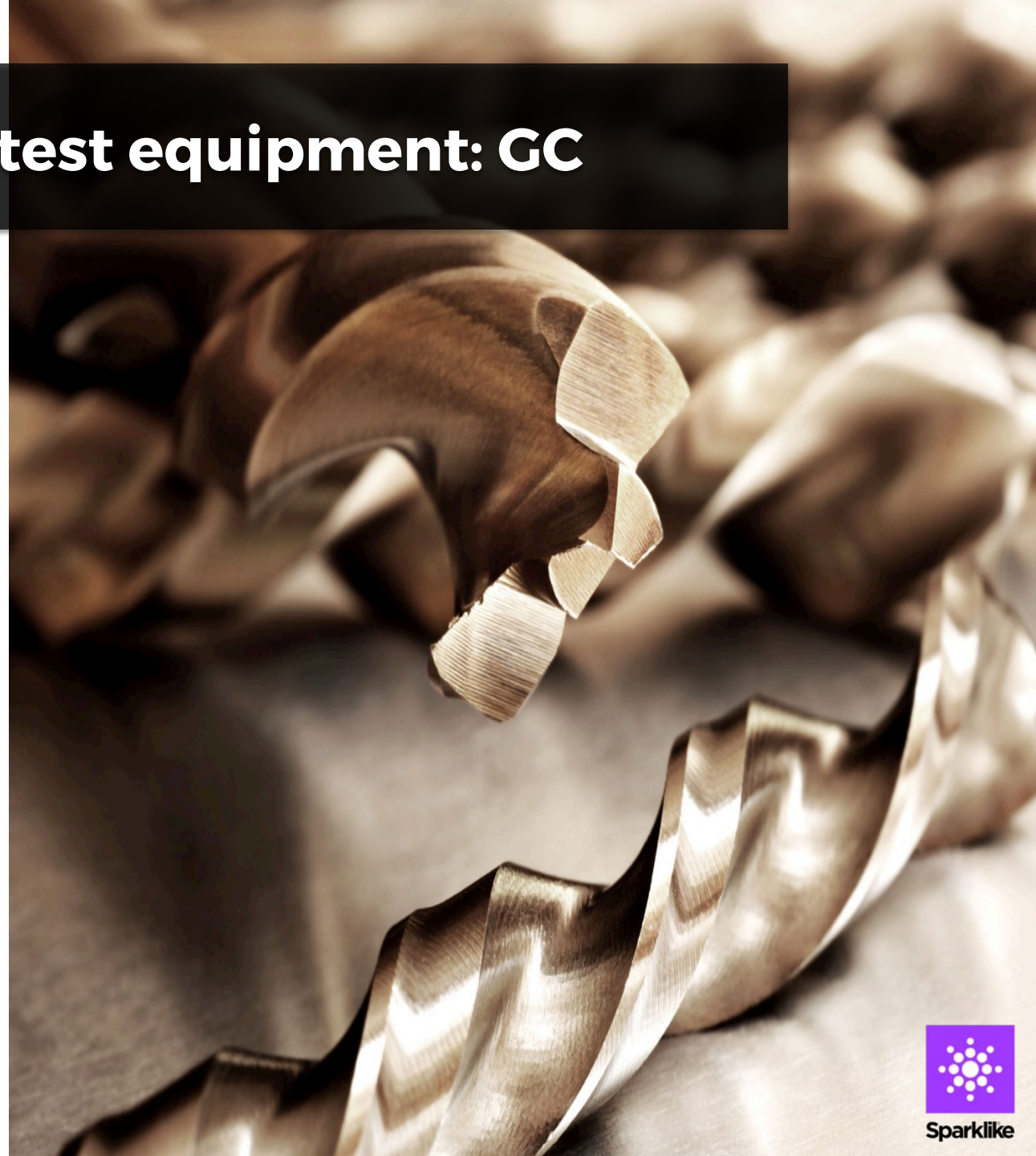
- Sparklike Laser™ uses 760 nm wavelength.
- Different coatings have different transmission.



Sparklike

Description of the test equipment: GC

- With GC, a vial is punched through the edge seal.
- Ift Rosenheim: Shimadzu GC-14B with a 4-meter Packed Column set at 15 °C.
- TÜV Rheinland: Varian CP-4900 micro GC with a 20-meter molecular sieve 5A PLOT column set at 30 °C.
- The measurement uncertainty: ± 1,0 %.



Description of the test specimen

- 7 double and 16 triple glazed units with different types of glass and coatings.
- The insulating glass unit combinations were selected to be challenging and thus, descriptive of the limits.

Sparklike

Description of the test specimen

- IGU's were tested with Sparklike Laser™ and gas chromatographs.
- Sparklike Laser™: the samples were measured 5 times from both sides: from A to B and from B to A.
- Gas chromatographs: 3 gas samples were taken from each IGU and analysed for argon concentration.
- The last two gas sample values were used for evaluation, according to both, ift Rosenheim and TÜV Rheinland processes.

Sparklike

Test results: double glazed IGU

Sample #	Sparklike measured side	Laser Cavity	GC Cavity	Margin of Error
1	A	96,0 %	94,8 %	**1,2 %**
	B	95,3 %		**0,5 %**
2	A	85,1 %	83,4 %	**1,7 %**
	B	83,1 %		**-0,3 %**
3	A	94,3 %	94,4 %	**-0,1 %**
	B	95,4 %		**1,0 %**
4	A	86,7 %	87,8 %	**-1,1, %**
	B	87,5 %		**-0,3 %**
5	A	89,6 %	90,0 %	**-0,4 %**
	B	88,8 %		**-1,2 %**
6	A	92,4 %	92,1 %	**0,3 %**
	B	90,5 %		**-1,6 %**
7	A	91,5 %	90,8 %	**0,7 %**
	B	90,5 %		**-0,3 %**

Sparklike

Test results: triple glazed IGU

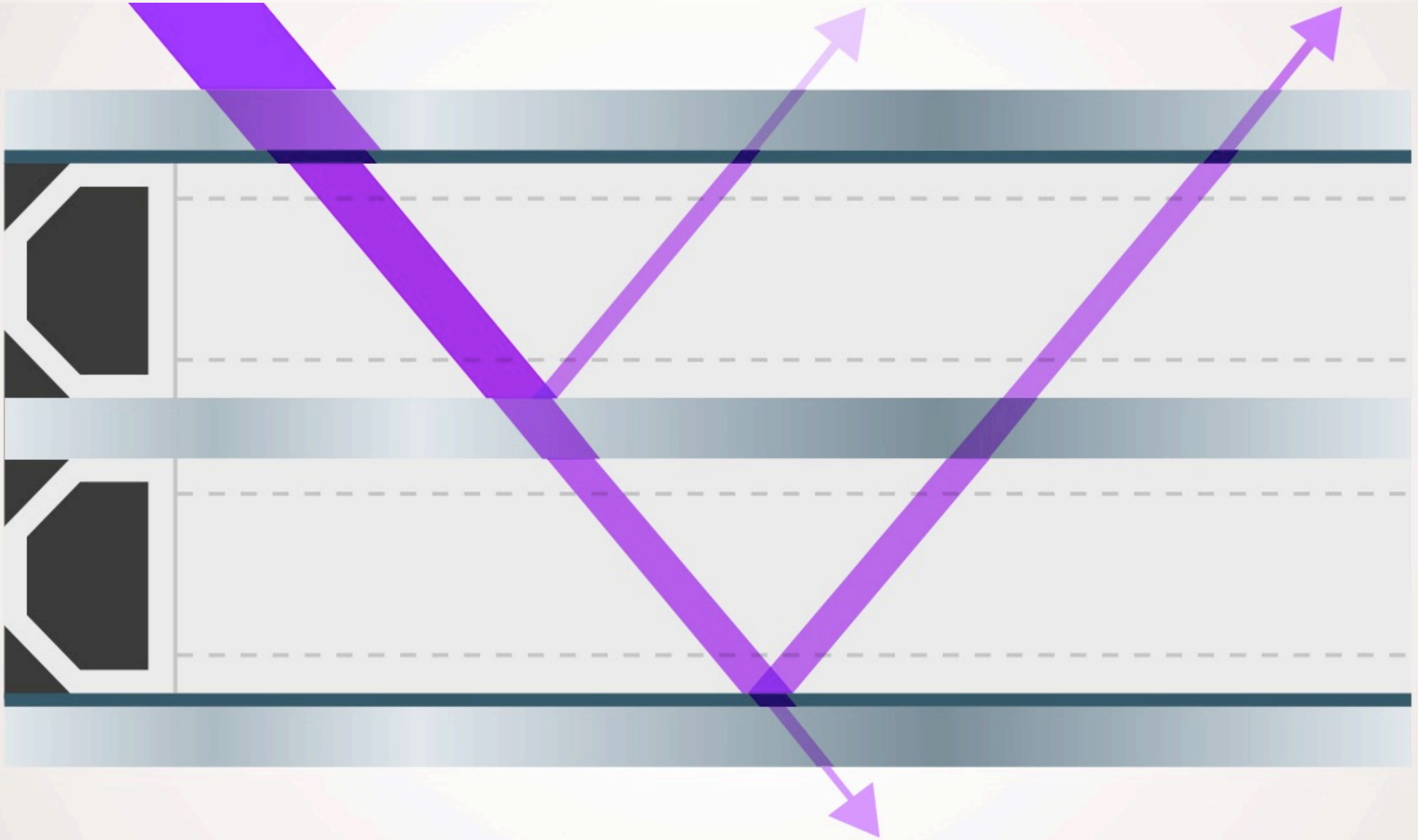
Sample #	Sparklike measured side	Laser Cavity 1	GC Cavity 1	Margin of Error	Laser Cavity 2	GC Cavity 2	Margin of Error
8	A	82,1 %	82,2 %	**-0,1 %**	67,3 %	69,1 %	**-1,8 %**
	B	83,6 %		**1,4 %**	64,9 %		**-4,2 %**
9	A	84,6 %	85,2 %	**-0,6 %**	83,2 %	82,9 %	**0,3 %**
	B	85,4 %		**0,2 %**	81,2 %		**-1,7 %**
10	A	86,2 %	86,8 %	**-0,6 %**	82,3 %	82,3 %	**0,0 %**
	B	88,3 %		**1,5 %**	80,1 %		**-2,2 %**

Sparklike

Test results: triple glazed IGU

Sample #	Sparklike measured side	Laser Cavity 1	GC Cavity 1	Margin of Error	Laser Cavity 2	GC Cavity 2	Margin of Error
11	A	89,8 %	89,5 %	**0,3 %**	91,0 %	89,8 %	**1,2 %**
	B	87,5 %		**-2,0 %**	90,1 %		**0,3 %**
12	A	93,2 %	93,9 %	**-0,7 %**	86,8 %	86,9 %	**-0,1 %**
	B	93,3 %		**-0,6 %**	86,4 %		**-0,5 %**
13	A	89,3 %	91,6 %	**-2,3 %**	91,3 %	92,6 %	**-1,3 %**
	B	89,0 %		**-2,6 %**	91,9 %		**-0,7 %**
14	A	74,9 %	93,0 %	**-18,1 %**	99,7 %	94,4 %	**5,3 %**
	B	93,2 %		**0,2 %**	93,5 %		**-0,9 %**
15	A	85,9 %	92,7 %	**-6,8 %**	96,8 %	90,9 %	**5,9 %**
	B	93,0 %		**0,3 %**	92,0 %		**1,1 %**
16	A	84,5 %	85,0 %	**-0,5 %**	91,0 %	89,6 %	**1,4 %**
	B	85,9 %		**0,9 %**	87,7 %		**-1,9 %**
17	A	61,4 %	94,4 %	**-33,0 %**	96,9 %	94,6 %	**2,3 %**
	B	94,8 %		**0,4 %**	94,2 %		**-0,4 %**
18	A	84,7 %	92,6 %	**-7,9 %**	92,2 %	90,8 %	**1,4 %**
	B	92,2 %		**-0,4 %**	89,7 %		**-1,1 %**
19	A	-	91,6 %	**-**	-	93,5 %	**-**
	B	92,3 %		**0,7 %**	91,1 %		**-2,4 %**

Sparklike



Sparklike

Conclusion

- All 19 samples were measurable by using Sparklike Laser™.
- Double glazed units:
  - The highest margin of error was ± 0,5% (absolute) compared to the gas chromatograph >> the obtained results are inside of uncertainty level of the gas chromatography method.
- Triple glazed units:
  - All units met the requirements described in the standard EN 1279-3, allowing ± 3,0% (absolute) margin of error
  - 75% of the result differences are smaller than ± 2,0% (absolute) compared to gas chromatography.

Sparklike

Test results

Sparklike Laser™ can measure even the most challenging insulating glass structures' gas concentration non-destructively and complying with the EN 1279-3 standard.

Sparklike


Sparklike®