



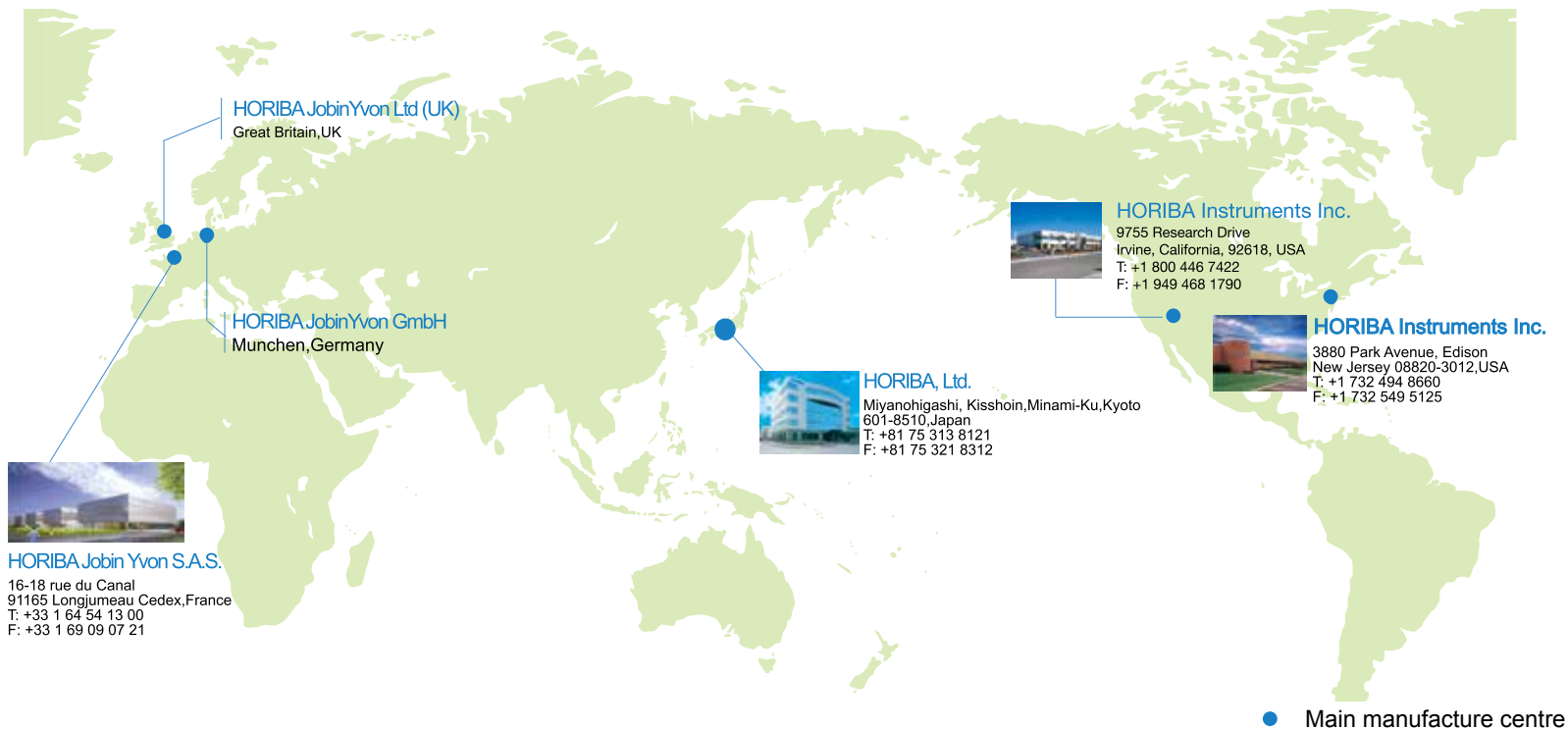
HORIBA

Scientific

2016

● HORIBA Scientific, part of HORIBA Instruments, Inc., headquartered in the United States, provides an extensive array of instruments and solutions for applications across a broad range of scientific R&D and QC measurements. HORIBA Scientific is a world leader in elemental analysis, fluorescence, forensics, GDS, ICP, particle characterization, Raman, spectroscopic ellipsometry, sulphur-in-oil, water quality and XRF. Our instruments are found in universities and industries around the world. Proven quality and trusted performance have established widespread confidence in the HORIBA Brand.

The HORIBA Group of worldwide companies, part of HORIBA, Ltd. headquartered in Kyoto, Japan, provides an extensive array of instruments and systems for applications ranging from automotive R&D, process and environmental monitoring, in-vitro medical diagnostics, semiconductor manufacturing and metrology, to a broad range of scientific R&D and QC measurements.



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	Art Museum Geology	Optics Physics	Bio Life Science	Battery Solar	Semicon Display Lighting	Environment Water	Metal Rare earth	Oil Painting	Nano	Chemistry Polymer	Pharmacy Cosmetic	Material Surface
OPTICAL SPECTROSCOPY												
Scientific Grating	◆	◆			◆	◆	◆		◆	◆	◆	
VUV Systems			◆		◆	◆		◆	◆	◆	◆	◆
OEM Grating & Spectrometers	◆	◆	◆		◆	◆	◆	◆	◆	◆	◆	
Optical spectroscopy	◆	◆	◆	◆	◆	◆			◆	◆	◆	◆
MOLECULAR SPECTROSCOPY												
Raman Spectrometer	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Fluorescence Spectrometer	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Surface Plasmon Resonance imaging (SPR)			◆			◆				◆	◆	◆
SURFACE CHARACTERIZATION												
Ellipsometry				◆	◆		◆	◆	◆	◆	◆	◆
GD-OES				◆	◆		◆	◆		◆		◆
Plasma Profiling-TOFMS				◆	◆		◆	◆		◆		◆
Cathodoluminescence	◆		◆		◆				◆		◆	◆
Atomic Force Microscope		◆	◆	◆	◆				◆	◆		◆
PARTICLE SIZE ANALYSIS												
Particle Analyzer	◆		◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
ELEMENTAL ANALYSIS												
ICP-OES			◆	◆		◆	◆	◆		◆	◆	
X-Ray Fluorescence Analyzer	◆	◆	◆	◆	◆	◆	◆	◆		◆	◆	◆
Energy Dispersive X-ray Micro Analyzer	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
C/S/O/N/H Analyzer				◆	◆	◆	◆					
Sulfur-in-Oil Analyzer				◆	◆	◆	◆			◆		



Grating General Information

- Scientific gratings for research

Founded in 1819, HORIBA Jobin Yvon has always been a leader on the development and production of Scientific Gratings. Through our cooperation with the top worldwide research centers, we continuously improve our techniques to reach the highest performance levels.

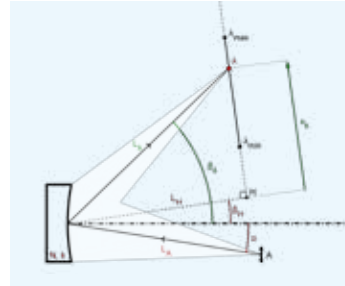
Applications include: high-intensity & ultrafast lasers, astronomy and space experiments, synchrotron, VUV and soft X-ray spectroscopy



- OEM gratings for instrument manufacturers

HORIBA Jobin Yvon invented the Concave Flat Field grating in 1967. Flat Field Gratings can image a spectrum directly on a linear detector (eg: CCD,PDA...). No other optics are required: Spectra become more compact and stable with higher efficiency and lower stray light.

- Imaging of Concave Flat Field Grating



- Linear dispersion

$$\frac{d\lambda}{dx} = \frac{10^{-6} \cos(\beta_\lambda) \cos^2(\beta_\lambda - \beta_H)}{kNL_H}$$

$$\beta_\lambda = \sin^{-1}[10^{-6} kN\lambda - \sin\alpha]$$

$$x_\lambda = L_H \tan(\beta_\lambda - \beta_H)$$

$$L_\lambda = \frac{L_H}{\cos(\beta_\lambda - \beta_H)}$$

N : Groove density (gr/mm)
 k : Order of diffraction (integer)

Spectrometer General Information

- Linear dispersion

$$d_\lambda/d_x = 10^6 \cos(\beta) / k.n.f \text{ [nm / mm]}$$

k : order number

n : groove density

f : focal length (mm)

- Conversion formula

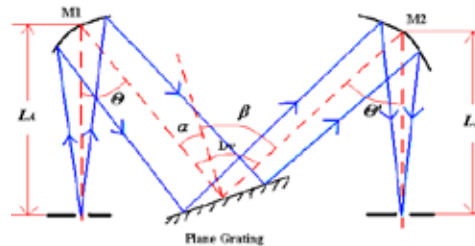
$$\text{nm} \& \text{ eV} \quad E_{(\text{eV})} = 1240 / \lambda_{(\text{nm})}$$

$$\text{nm} \& \text{ cm}^{-1} \quad \tilde{\nu}_{(\text{cm}^{-1})} = 10^7 / \lambda_{(\text{nm})}$$

- Planck relation

$\Delta E = hu$ h : Planck constant, $6.625 \cdot 10^{-34} \text{ J}\cdot\text{s}$ ΔE : The energy of a charged atomic oscillator

- C-T configuration optical layout

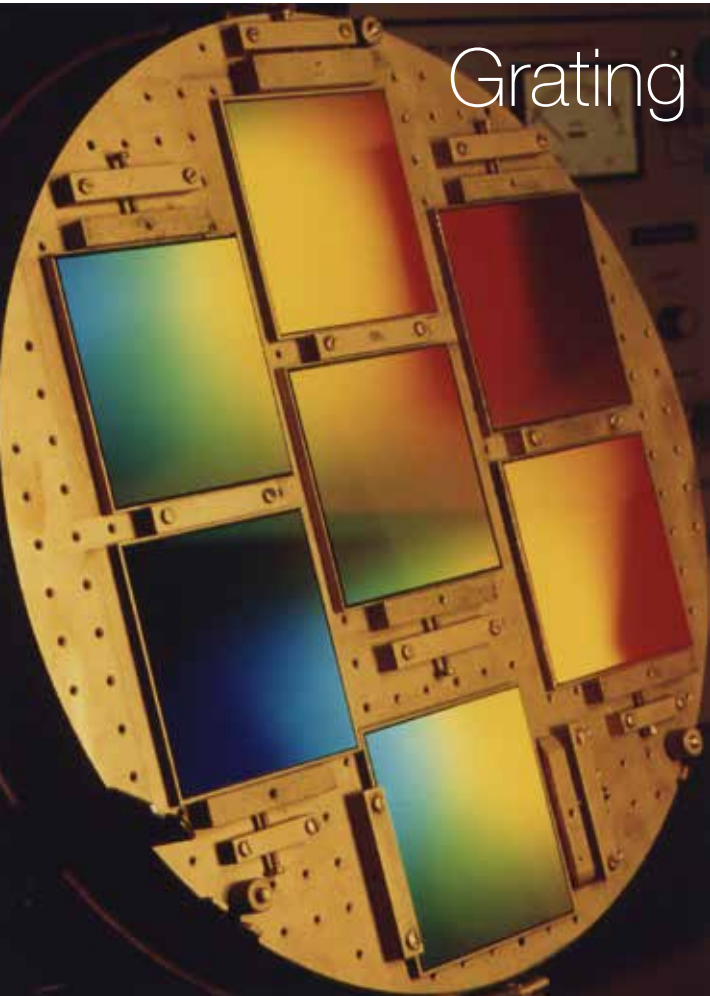


- Applications

- Photoluminescence
- Fluorescence
- VUV Spectrum
- Laser Spectrum
- Plasma Emission Spectrum
- Absorption
- Transmission
- Reflection

- Monochromator Tips

- Thinner slit gives better resolution but lowers the throughput
- Longer focal length gives better resolution but lowers the throughput (and increases the price!)
- Higher groove density gives better resolution but reduces the measurable spectral range



Grating

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

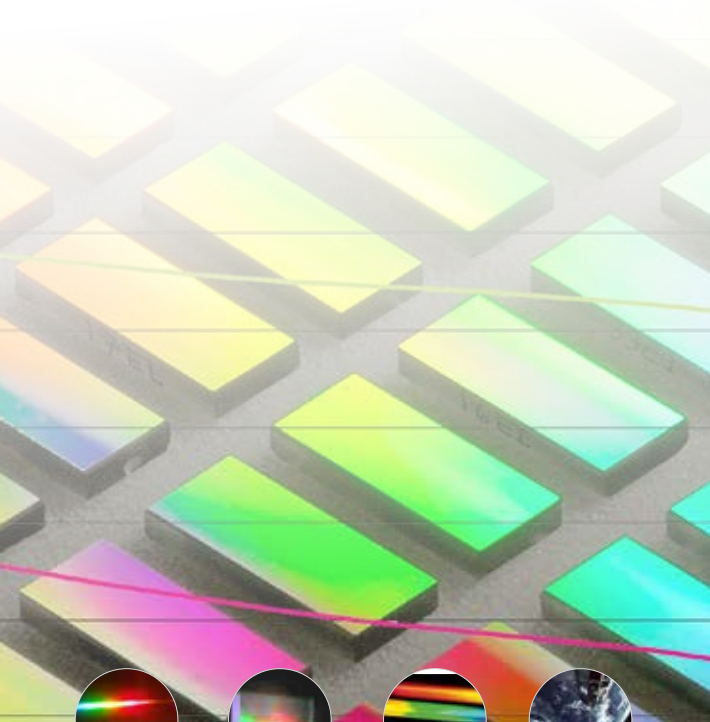
December
12
 2015

HORIBA
 Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
29	30	01	02	03	04	05
06	07	08	09	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25 <i>Christmas</i>	26
27	28	29	30	31	01	02



Grating



SUN	MON	TUE	WED	THU	FRI	SAT
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22	23	24	25	26	27	28
29	30	31				

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
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28	29					

Check List

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Gold coated master gratings



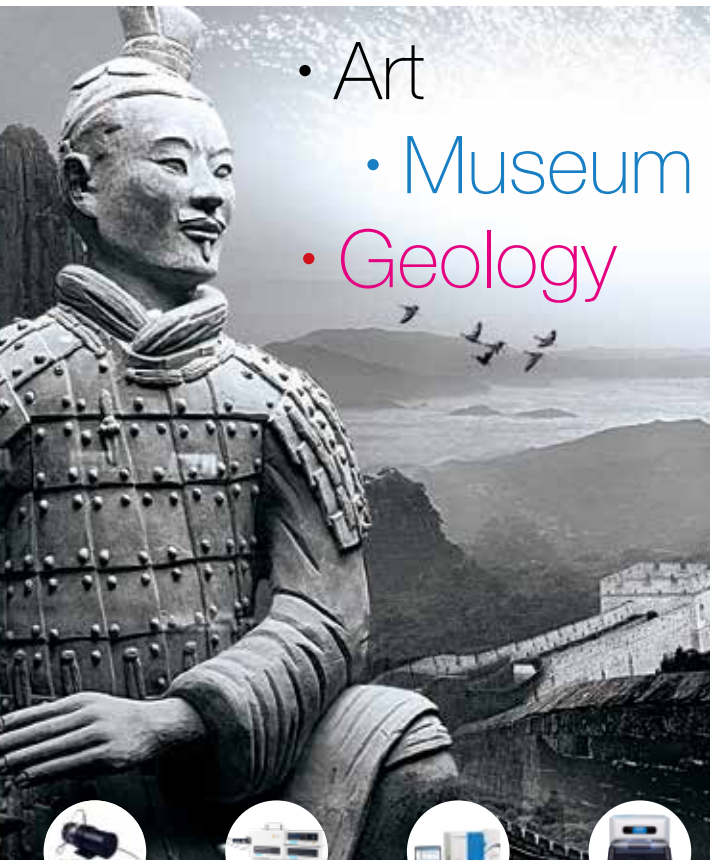
Multi-layer dielectric gratings



VUV custom gratings



Custom gratings for astronomy and space flight







- Art
- Museum
- Geology

SUN MON TUE WED THU FRI SAT

1 2 3 4 5 6
 7 8 9 10 11 12 13
 14 15 16 17 18 19 20
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1 January
 2016

HORIBA
 Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
27	28	29	30	31	01 <i>New Year's Day</i> 	02 
03 	04	05	06	07	08	09
10	11 	12	13	14	15	16
17	18	19	20	21	22	23
24/31	25	26	27	28	29	30



Raman Spectrometer Fluorescence Spectrometer Particle Analyzer X-Ray Fluorescence Analyzer

• Optics

• Physics



Raman Spectrometer



Fluorescence Spectrometer



Optical spectroscopy



X-Ray Fluorescence Analyzer



Scientific Grating

SUN MON TUE WED THU FRI SAT

1 2 3 4 5
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27 28 29 30 31

February 2 2016

HORIBA Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
31	01	02	03	04	05	06
07 <i>New Year's Eve</i>	08 <i>Spring Festival</i>	09	10	11	12	13
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14 <i>Valentine's day</i>	15	16	17	18	19	20
🇺🇸	🇺🇸	🇺🇸				
21	22	23	24	25	26	27
	🇺🇸					
28	29	01	02	03	04	05

- Bio
- Life Science



Raman Spectrometer



Fluorescence Spectrometer



Particle Analyzer



Surface Plasmon Resonance imaging (SPRI)



OEM Grating & Spectrometers

SUN MON TUE WED THU FRI SAT

			4		1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
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March 3 2016

HORIBA
Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
28	29	01	02	03	04	05
06	07	08 <i>The Women's Day</i>	09	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	01	02

- Battery
- Solar



Raman Spectrometer Fluorescence Spectrometer Ellipsometry GD-OES Particle Analyzer

SUN	MON	TUE	WED	THU	FRI	SAT
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22	23	24	25	26	27	28
29	30	31				

4 April
2016

HORIBA
Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
27	28	29	30	31	01	02
03	04	05	06	07	08	09
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- Semicon
- Display
- Lighting



Raman Spectrometer Fluorescence Spectrometer Ellipsometry GD-OES Particle Analyzer

SUN	MON	TUE	WED	THU	FRI	SAT
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May 5 2016

HORIBA
Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
01 <i>International Labour Day</i> 	02 	03 	04 	05 	06 	07
08 <i>Mother's Day</i> 	09	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27 	28
29 	30 	31	01	02	03	04



• Environment

• Water



Raman Spectrometer



Fluorescence Spectrometer



ICP-OES



Particle Analyzer





OEM Grating & Spectrometers

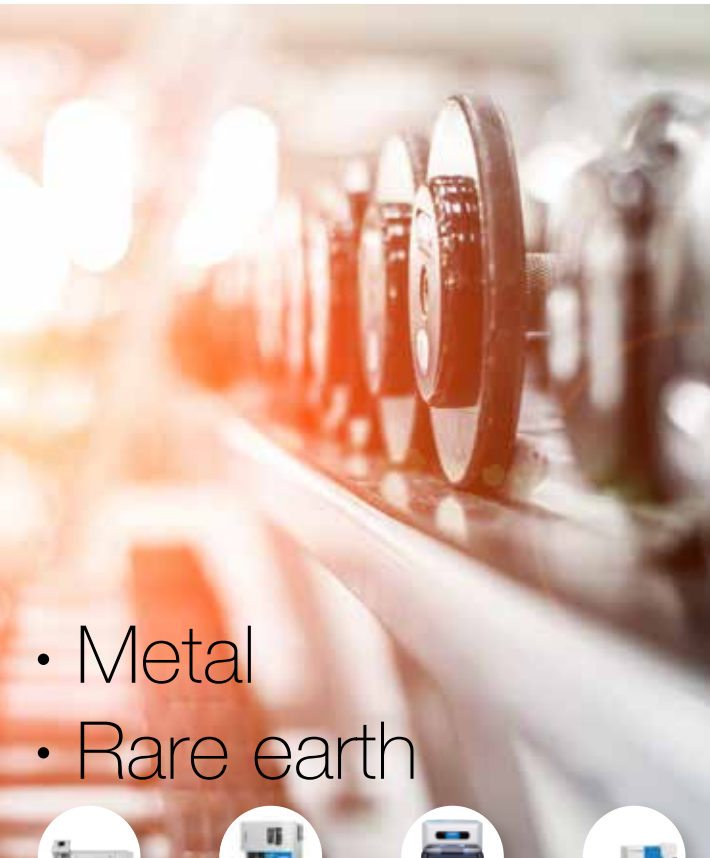
SUN MON TUE WED THU FRI SAT

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17 18 19 20 21 22 23
24/31 25 26 27 28 29 30

June
6
2016

HORIBA
Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
29	30	31	01 <i>The Children's Day</i>	02	03	04
05	06	07	08	09	10	11
12	13 	14	15	16 	17 	18 
19 <i>Father's Day</i>	20	21	22	23	24	25
26	27	28	29	30	01	02



- Metal
- Rare earth



ICP-OES



C/S/O/N/H Analyzer



X-Ray
Fluorescence Analyzer









Particle
Analyzer

SUN MON TUE WED THU FRI SAT

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July
7
2016

HORIBA
Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
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24/31				28	29	30



- Oil
- Painting

SUN MON TUE WED THU FRI SAT

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August
8
2016

HORIBA
Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
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28	29	30	31	01	02	03



ICP-OES



X-Ray
Fluorescence Analyzer



Particle
Analyzer



Fluorescence
Spectrometer

• Nano



AFM-Raman



Fluorescence Spectrometer



Particle Analyzer



Optical spectroscopy



Cathodoluminescence

SUN MON TUE WED THU FRI SAT

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9 September 2016

HORIBA
Scientific

SUN	MON	TUE	WED	THU	FRI	SAT
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• Chemistry

• Polymer

SUN MON TUE WED THU FRI SAT

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October
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2016

HORIBA
Scientific

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AFM-Raman



Fluorescence Spectrometer



Particle Analyzer



Optical spectroscopy

• Pharmacy

• Cosmetic



SUN MON TUE WED THU FRI SAT

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November
11
 2016

HORIBA
 Scientific

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Raman Spectrometer



Fluorescence Spectrometer



Particle Analyzer



Surface Plasmon Resonance imaging (SPRi)

- Material
- Surface



SUN MON TUE WED THU FRI SAT

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December
12
 2016

HORIBA
 Scientific

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25 *Christmas*

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Raman Spectrometer



Fluorescence Spectrometer



Particle Analyzer



X-Ray Fluorescence Analyzer



Ellipsometry

Running the Experiment, Do Not Switch off!

**Equipment under Maintenance,
Do Not Use!**