# Frush

Optical Frequency Comb

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## Features:

- FSR 12 – 18 GHz
- Flat Spectrum Profile
- High Temporal Stability

## Applications:

- Terahertz wave generation
- Next-generation communication R&D
- Advanced spectroscopy applications

## Optical Frequency Comb (OFC) Generator

Frush generates a flat OFC in the free spectral range (FSR) of 12-18 GHz, enabling highly precise frequency measurements and signal generation. Utilizing advanced Electro-optic modulation (EOM) technology, Frush precisely controls and stabilizes the OFC. This feature allows the extraction of any two longitudinal modes from the optical spectrum to generate millimeter-wave and terahertz signals in the frequency range of 12-200 GHz. Additionally, Frush produces picosecond pulse light at repetition frequencies corresponding to the FSR, making it usable as an ultra-short pulse laser with a repetition frequency exceeding 12 GHz.


The optical modulator built into Frush is a single unit composed entirely of polarization-maintaining fiber (PMF). This simple and robust design, along with a high-performance auto-bias controller, ensures a short warm-up time and high stability.

Frush does not independently generate an OFC; it requires an external signal source, such as a continuous-wave (CW) laser and an RF signal generator. While this may seem like a complex and costly design, it contributes to minimizing expenses by making effective use of the user's existing equipment. Even if you need to acquire new signal sources, they can be utilized in other research and development activities, allowing for a highly efficient research operation.

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## Recommended Signal Source Specs

| CW lasers | figures |
|---|---|
| Central Wavelength | 1550 ± 20 nm |
| Average Output | 13 – 17 dBm |
| Linewidth | ≦ 3 MHz |
| Output Connector/Fiber | FC/APC, PMF |

| RF Signal Generator | figures |
|---|---|
| Frequency Coverage | Include 12 – 18 GHz |
| Output waveform, output | Sine Wave, 20 dBm |

## Specifications

| Frush | figures |
|---|---|
| Central Wavelength | 1550 ± 20 nm |
| Average Output<br>@ 13 dBm Input | > -7 dBm |
| Compressed/Uncompressed<br>Pulse Width | ≦ 6 ps / > 25 ps |
| FSR (Factory Set) | 12 – 18 GHz |
| Spectral Bandwidth<br>at -20 dB (Typ.) | > 200 GHz (230 GHz) |
| Input/Output Optical<br>Fiber Connector | FC/APC, PMF |
| Operating Temperature | 20 – 30℃ |
| Size H × W × D | 148 × 480 × 430 mm |

The average output depends on the average output of the CW laser source. The timing jitter of the optical pulses depends on the phase noise of the RF signal generator. For more detailed specifications and specific usage instructions, please contact the Sales Department at sevensix. If you require center wavelengths other than the specified wavelength, such as 1530 nm, or output with non-linear polarization, please feel free to consult with us. We can also provide proposals for broadening the bandwidth and femtosecond pulse shortening, starting from the supply of signal sources and RF signal generators.

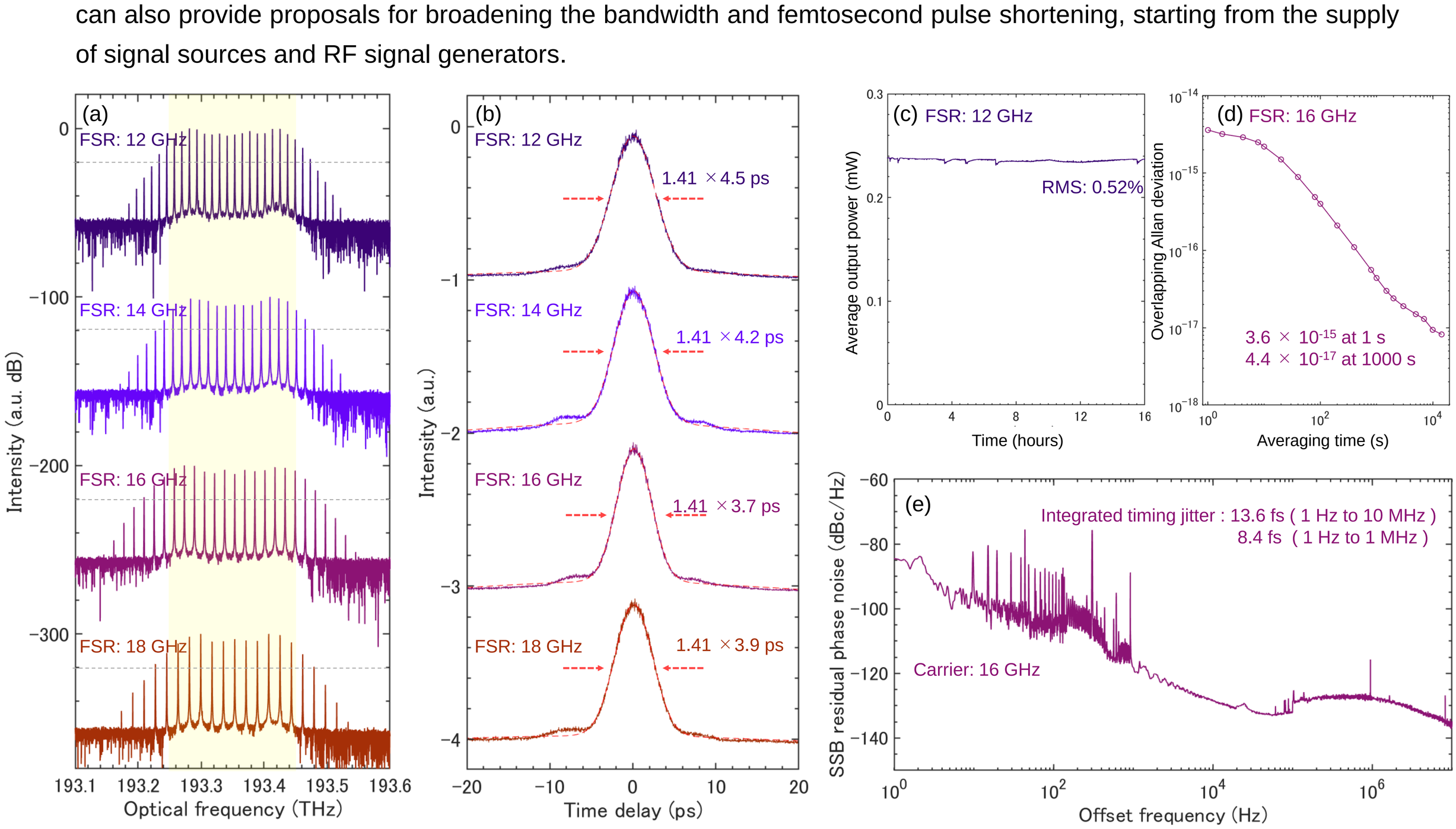


**Fig.** Typical measurement data for the optical characteristics of Frush. (a) Optical spectrum at FSRs of 12, 14, 16, and 18 GHz (gray dashed line represents the -20 dB line, yellow area indicates the 200 GHz range), (b) Autocorrelation waveform after pulse compression and the estimated pulse width obtained by Gaussian fitting of the corresponding waveform. The spectral and autocorrelation waveforms are acquired simultaneously. (c) Optical average output power stability over 16 hours at an FSR of 12 GHz. Similar stability is observed at other FSRs. The average output power stability is closely related to comb spectral shape variation which almost didn't change over 16 hours test time. (d) Relative frequency stability and (e) Relative phase noise between the RF signal generator and the repetition rate of the OFC from Frush after 1 hour of operation in a typical optical laboratory environment.


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