



Figure 1. The FTS 4050 Primary Cesium Beam Frequency and Time Standard.

Table 1. Specifications of the FTS 4050 (at 28 V dc and 25°C unless otherwise noted).

Parameter	Specification*	Parameter	Specification*
<b>Accuracy</b>		<b>Time to acquisition of lock:</b>	@ 25°C, 45 min
Fractional frequency deviation from accepted definition by the 13th General Conference of Weights and Measures as realized by the National Bureau of Standards:	$\pm 7 \times 10^{-12}$	<b>Sinusoidal outputs (independently buffered)</b>	1, 5, and 10 MHz 1 V rms/50 Ω
<b>Stability</b>		Output amplitude:	
Fractional frequency fluctuation (square root of the two-sample or Allan variance; see Figure 2)		Harmonic distortion (below rated output):	>40 dB
<b>Averaging time <math>\tau</math></b>	<b>Standard Tube</b>	Spurious (below rated output):	>80 dB
0.01 s	$2 \times 10^{-10}$	Signal-to-phase-noise ratio (bandwidth = 30 kHz):	>87 dB
1 s	$7 \times 10^{-12}$	<b>1-pps clock output</b>	Standard feature
10 s	$7 \times 10^{-12}$	Output amplitude:	3 V peak/50 Ω
100 s	$5 \times 10^{-12}$	Pulse width:	1 μs minimum
10 <sup>3</sup> s	$2 \times 10^{-12}$	Rise time:	<50 ns
10 <sup>4</sup> s	$5 \times 10^{-13}$	Fall time:	<50 ns
10 <sup>5</sup> s	$2 \times 10^{-13}$	Synchronization:	Automatic within 100 ns
Maximum change over the life of the cesium beam tube of absolute fractional frequency (does not include environmental effects):	$\pm 3 \times 10^{-12}$	<b>Operating temperature range:</b>	0 to 50°C
<b>Single-sideband phase noise</b>		<b>Nonoperating temperature range</b>	
(bandwidth = 1 Hz; see Figure 3)		Storage:	-40 to 50°C
<b>Offset from signal</b>	<b>Standard tube</b>	Short term:	-40 to 75°C
10 <sup>-3</sup> Hz	-12 dBc	<b>Humidity (operating):</b>	95% up to 50°C
10 <sup>-2</sup> Hz	-32 dBc	<b>Shock:</b>	MIL-E-5400
10 <sup>-1</sup> Hz	-52 dBc	<b>Vibration:</b>	MIL-STD-167-1
1 Hz	-100 dBc	<b>EMC:</b>	MIL-STD-461
10 Hz	-130 dBc	<b>Power inputs</b>	
100 Hz	-140 dBc	ac (47 to 400 Hz):	115 V ac
1000 Hz	-140 dBc	dc:	22 to 30 V dc
<b>Settability</b>		<b>Power requirement (after warm-up @ 25°C)</b>	
Degree to which the fractional frequency can be set to match a reference (no degaussing required):	$\pm 2 \times 10^{-13}$	ac:	42 W
<b>Retrace (reproducibility)</b>		dc:	27 W
Maximum fractional frequency deviation after interruption and resumption of operation:	$\pm 3 \times 10^{-12}$	<b>Battery capacity</b>	3 hr (Option 010)
<b>Maximum frequency change</b>		Battery type:	Sealed lead acid
Over operating temperature range:	$< 5 \times 10^{-12}$	Extension of battery capacity:	Optional accessory chassis
Under dc magnetic field (2 gauss):	$< 2 \times 10^{-12}$	<b>Dimensions</b>	
In altitude (40,000 ft):	$2 \times 10^{-12}$	Height:	133 mm (5 7/32")
		Width:	482 mm (19")
		Depth:	533 mm (21")
		Weight:	20.5 kg (45 lb)
		<b>Periodic adjustment:</b>	None
		<b>Cesium beam tube warranty</b>	
		Standard tube:	5 years
		Option 004:	15 months

\* All specifications for the Option 004 high-performance tube are identical to those of the standard FTS 4050 tube except as listed.