



## SYSTEM PLANNING CORPORATION



### Cheetah Measurement System Overview

The Cheetah Measurement System leverages widely commercialized network analyzer technology to yield exceptional value. Using a network analyzer for RCS and antenna measurements began as a novel idea in 1985. Back then, measurement speeds were slow and often impractical. More recent Performance Network Analyzers (PNAs) have shattered this early paradigm. Today, a measurement that would have taken an hour can be made in about 18 minutes.

The Cheetah Measurement System leverages these advancements to provide state of the art measurement sensitivity at practical speeds and a very affordable price. Cheetah systems are turn-key and based on a total system design approach that addresses the many nuances required to achieve accurate and reliable RCS data. The versatile Cheetah architecture supports custom frequency bands anywhere in the range 10 MHz to >100 GHz. A turn-key system integrates a PNA with a gated transceiver unit, software, a PC, and other options including antennas, target control equipment, training, and extended warranty/support. All Cheetah systems are designed, integrated, and backed by System Planning Corporation, founders of the instrumentation radar industry with over 25 years experience.

### Gated Cheetah Transceiver Advantage

The gated Cheetah transceiver dramatically enhances the ability of a PNA to collect RCS and antenna data. The transceiver incorporates low noise amplifiers that improve measurement sensitivity by more than 30 dB compared to measurements using a stand-alone PNA. The transceiver also incorporates high isolation gating switches that preserve the PNA's dynamic range. An integrated timing unit with 500 psec resolution and 250 psec jitter enables precise range gating and clutter suppression during RCS measurements. Amplification in the transceiver's Tx path improves sensitivity during RCS measurements and link margin during antenna measurements.

### Cheetah Measurement Software

The Cheetah hardware supports both RCS and antenna measurements. Full featured software for both applications is provided by CompuQuest, a trusted and well-established name within RCS and antenna measurement communities. A brief overview of the software features is presented below. For full details, please contact SPC to request a .pdf version of the Cheetah software manuals.

#### RCS Measurement Software

- RCS vs. Azimuth
- ISAR imaging
- Full polarization matrix
- Simultaneous full polarization matrix (requires optional hardware)
- Background subtraction
- Phase coding (requires optional hardware)

- RCS calibration with full library of all common calibration standards
- Remote control of radar over the Internet
- Full access to radar timing signals and control
- Range walk
- Transmit power leveling for optimal dynamic range
- Multi-axis position control (requires optional hardware)
- Radar diagnostic tools (optional add-on)
- Easy to learn graphical users interface
- Remote control of radar via wireless PDA (optional add-on)

#### Antenna Measurement Software

- Linear and Polar antenna patterns
- Fully automated axial ratio calculation
- Empty chamber subtraction
- Fully automated RMS calculation
- Full raster scanning for 3-D antenna patterns
- Near-field to far field correction based on NIST standards
- Automatic calculation of standard antenna parameters
  - N dB beam width
  - Directivity
  - Antenna efficiency
  - Gain
  - Side lobes
- Power sweeps for characterizing active antennas

### Core Cheetah System Components

1. Cheetah Transceiver (2–18 GHz)
2. Agilent PNA (0.01–20 GHz)
3. Measurement software
4. Computer/Monitor/Keyboard
5. Color printer
6. Premium instrumentation rack, single bay
7. System RF cabling
8. 12 ft RF antenna cable
9. System timing and interface cabling
10. Cheetah Owner's Manual
11. One year warranty
12. On-site installation

### Additional Options

#### Turnkey Systems

- RCS antennas
- Compact reflectors
- Position controllers
- Target positioners
- Target pylons
- Calibration targets
- Portable RCS measurement shelters
- Range layout and design
- Weather stations
- Analog-to-digital data recorders

#### Miscellaneous

- On-site training
- 4-year extended warranty and support

### SYSTEM PLANNING CORPORATION

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# Technical Specifications for the Core Cheetah Measurement System

## Core Cheetah Measurement System Specifications

2-18 GHz Transceiver	Min	Typ	Max	Units
Frequency Range	2		18	GHz
Peak transmit power	23	25		dBm
Noise figure		3.5	5	dB
TX to RX isolation	90			dB
Dynamic range (0.5 kHz IFBW >10% duty factor)	90			dB
Receiver sensitivity (0.5 kHz IFBW >10% duty factor)		-139	-136	dBm
TX pulse width (variable)	10		CW	nsec
RX gate width (variable)	10		CW	nsec
RF pulse rise time		3	4.5	nsec
RF pulse fall time		3	4.5	nsec
IF bandwidth	.001		40	kHz
<b>Timing unit</b>				
Maximum PRF	5	10		MHz
Pulse width	10			nsec
Pulse width adjustment resolution	500			psec
TX to RX gate delay	.010		1000	usec
TX to RX gate delay adjustment resolution	500			psec
RMS jitter			250	psec
Number of pulses per burst ( <i>applies when in burst mode</i> )	1		10 <sup>6</sup>	
<b>Environmental</b>				
Operating temperature	0		35	°C

## Cheetah Measurement System Capabilities

Description			
<b>RCS Capabilities</b>			
RCS vs azimuth		Standard	Optional
ISAR imaging		Standard	Optional
RCS calibration		Standard	Optional
Background subtraction		Standard	Optional
Range walk		Standard	Optional
Basic and Advanced Radar timing control		Standard	Optional
Remote operation via Internet		Standard	Optional
Full polarization matrix		Standard	Optional
Multi-axis motion control		Standard	Optional
Phase coding		Standard	Optional
Dual channel receive		Standard	Optional
Simultaneous full polarization matrix		Standard	Optional
Radar diagnostic software		Standard	Optional
<b>Antenna Measurement Capabilities</b>			
Linear and Polar antenna patterns		Standard	Optional
Fully automated axial ratio calculations		Standard	Optional
Empty chamber subtraction		Standard	Optional
Fully automated RMS calculation		Standard	Optional
Full raster scanning for 3-D antenna patterns		Standard	Optional
Near field to far field correction based on NIST standards		Standard	Optional
Automatic calculation of all standard antenna parameters		Standard	Optional

Standard = Standard, Optional = Optional



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## Typical Cheetah Frequency Bands

10-100 MHz
0.1-1 GHz
0.5-2 GHz
1-18 GHz
2-18 GHz
26.5-40 GHz
40-50 GHz
50-65 GHz
90-98 GHz

## Common Cheetah Measurement Configurations

The simplified block diagrams shown below represent two common measurement configurations for the Cheetah Measurement System.

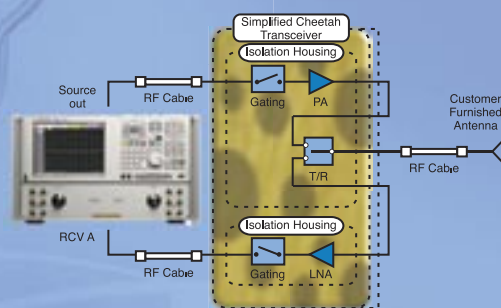


Figure 1: Typical Cheetah RCS measurement configuration

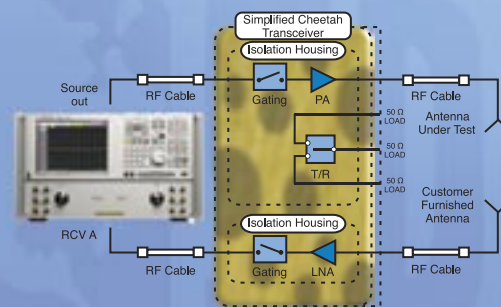


Figure 2: Typical Cheetah antenna measurement configuration



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