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Custom-designed W-band and D-band CW and Pulsed EPR Spectrometers



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***The science of today is the technology of tomorrow.
-- Edward Teller, American physicist and author***

To explore new horizons in EPR Spectroscopy, ELVA-1 Millimeter Wave Division and Ioffe Institute, Division of Solid State Physics (St.Petersburg, Russia) have reached a joint collaboration agreement to design and manufacture custom W-band and D-band EPR Spectrometers. Through this strategic alliance, we can now provide EPR Spectrometers that are much more customized to your high frequency project requirements than are available from other EPR equipment manufacturers.

While ELVA-1 Millimeter Wave Division has earned the respect of the world's EPR scientists for its high-power, low-noise microwave bridges and other sophisticated millimeter wave components, the Ioffe Institute is world-renowned as a centre of basic research. The specialized expertise of the laboratory headed by Prof. P.G. Baranov (Ioffe Institute) in the field of microwave spectroscopy (EPR, ODMR, high-frequency EPR and ENDOR) enables us to conduct full-size EPR spectrometer prototype testing to confirm required performance for each customer's order, before completing and delivering the production equipment.

ELVA's custom-designed EPR spectrometer

- Millimeter-wave (95GHz, 250 mW or 130GHz, 50 mW) CW or Pulse Bridge
- 6T, or 10T, or 12T superconducting magnet with a sweep possibility in the any range
- Tunable microwave cavity of TE_{011} (separately for pulsed and CW)
- CW data acquisition system
- Pulse acquisition electronics

Additional features available on request:

- Rotation of the sample about an axis perpendicular to that of the external magnetic field
- Field modulation (for CW measurements)
- Variable sample temperature in the range of 2 to 200K with the temperature controller system
- Optical access for photo-EPR measurements

Specifications of MW Bridges

CW: (CW + AM (amplitude modulation))

| N | Specs Parameters | W-band | D-band |
|----|--|---|---------------------------------|
| 1 | Central frequency | 95 GHz | 130 GHz |
| 2 | Central frequency stability | 30 kHz / hour (using DRO) | 30 kHz / hour (using DRO) |
| 3 | Operating frequency range (any fixed frequencies for DROs and tunable frequencies for VCO) | 400 MHz (95GHz+/- 0.2GHz) | 400 MHz (130GHz+/- 0.2GHz) |
| 4 | Ffrequency stability | 10 ⁻⁶ per °C | 10 ⁻⁶ per °C |
| 5 | Spectrum width @ -3 dB level | <1 kHz | <1 kHz |
| 6 | Max mm-wave power | Up to 250 mW | Up to 50 mW |
| 7 | Power stability | 0.02 dB per °C | 0.02 dB per °C |
| 8 | FM noise @ 10 kHz | -100 dBc/Hz max | -100 dBc/Hz max |
| 9 | AM noise @ 10 kHz | -140dBc/Hz max | -140dBc/Hz max |
| 10 | Attenuation of output power | 60 dB | 50 dB |
| 11 | Min switching time of amplitude modulation of output signal (10% to 90 % and 90% to 10% power level) | 5 nsec (5*10 ⁻⁹ sec) max, 3-4 ns typical | 5 nsec (5*10 ⁻⁹ sec) |
| 12 | Noise figure of receiver section | 12 dB | 14 dB |
| 13 | Max gain of receiver section | 50 dB | 50 dB |
| 14 | Receiver section bandwidth | 200 MHz | 200 MHz |

Pulse: (CW + AM + PM 0-90 deg., 0-180 deg. (phase modulation))

| N | Specs Parameters | W-band | D-band |
|----|---|---------------------------------|---------------------------------|
| 1 | Central frequency | 95 GHz | 130 GHz |
| 2 | Central frequency stability | 30 kHz / hour | 40 kHz / hour |
| 3 | Operating frequency range | 400 MHz (95 GHz+/-0.2GHz) | 400 MHz (130 GHz +/-0.2GHz) |
| 4 | Spectrum width @ -3 dB level | <1 kHz | 1 kHz |
| 5 | Power of amplitude noise | -140 dBc/Hz @ 100 kHz offset | -140 dBc/Hz @ 100 kHz offset |
| 6 | Max power | Up to 250 mW | Up to 50 mW |
| 7 | Changing of pulse output power | 60 dB | 50 dB |
| 8 | Changing of output power of CW channel | 120 dB | 100 dB |
| 9 | Min duration of output pulses at amplitude modulation of output power | 10 nsec (10-8 sec) | 10 nsec (10-8 sec) |
| 10 | Min switching time by 2PSK modulation of output signal | 5 nsec (5*10 ⁻⁹ sec) | 5 nsec (5*10 ⁻⁹ sec) |
| 11 | Accuracy of 180 deg phase shift keeping for 2PSK | 1 degree | 1 degree |
| 12 | Microwave power suppression during a pause between pulses | 100 dB | 100 dB |
| 13 | Switching time up to max suppression level | <10 nsec | 10 nsec |
| 14 | Noise figure of receiver section | 12 dB | 14 dB |
| 15 | Max gain of receiver section | 50 dB | 50 dB |
| 16 | Receiver section bandwidth | 200 MHz | 200 MHz |
| 17 | Total phase drift | 5 degrees / 15min | 5 degrees / 15 min |

EPR spectrometer life time (projected): about 30,000 operating hours

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