

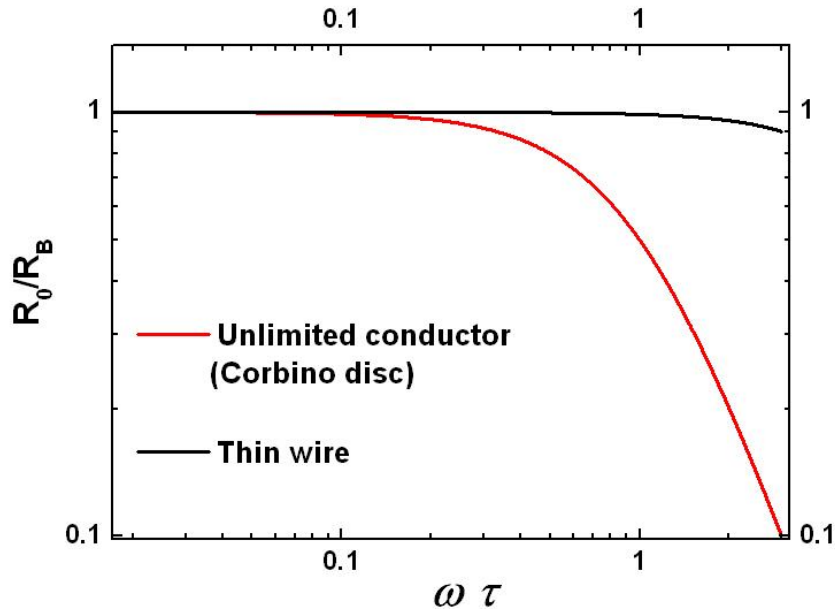


**MAGNETORESISTANCE OF SHOCK-COMPRESSED
NON-IDEAL ARGON PLASMA**

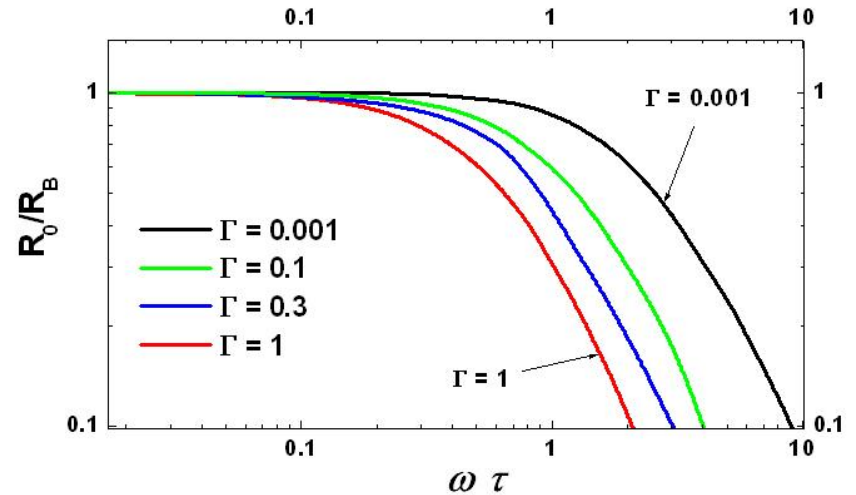
Yuriev D.S., Shilkin N.S., Mintsev V.B., Fortov V.E.
IPCP RAS, Chernogolovka

MAGNETORESISTANCE EFFECT

INFLUENCE OF GEOMETRY ON MAGNETORESISTANCE



INFLUENCE OF NON-IDEALITY ON MAGNETORESISTANCE



Calculation from:
 Zaika E.V., Mulyko I.A., Homkin A.L. // TVT 2000 V.38.,N.6 P.853-861

$$\omega = \frac{eB}{m_e} \text{ - electron cyclotron frequency}$$

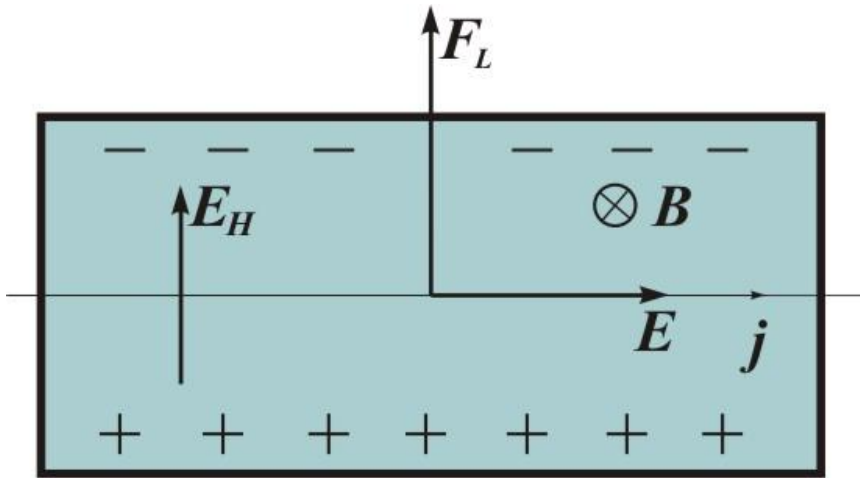
$$\tau = \frac{\sigma_0 m_e}{n_e e^2} \text{ - relaxation time}$$

R_0 - resistance without magnetic field

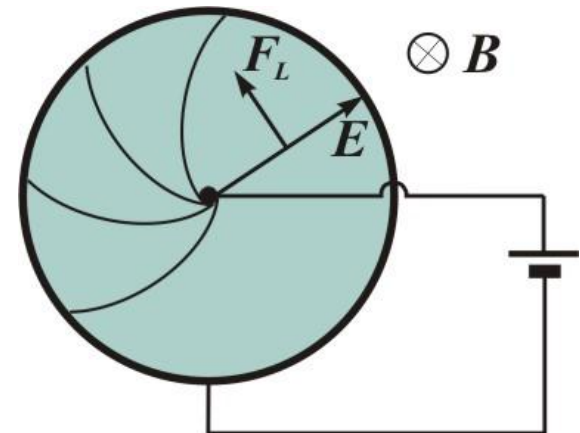
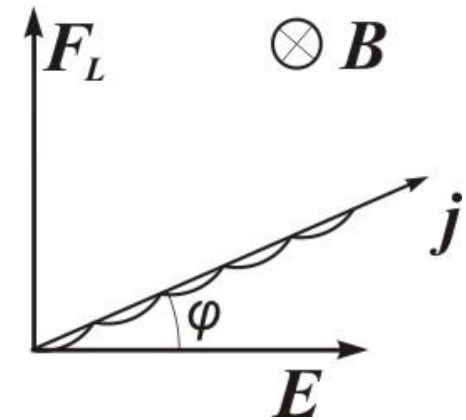
R_B - resistance in magnetic field

MAGNETORESISTANCE EFFECT

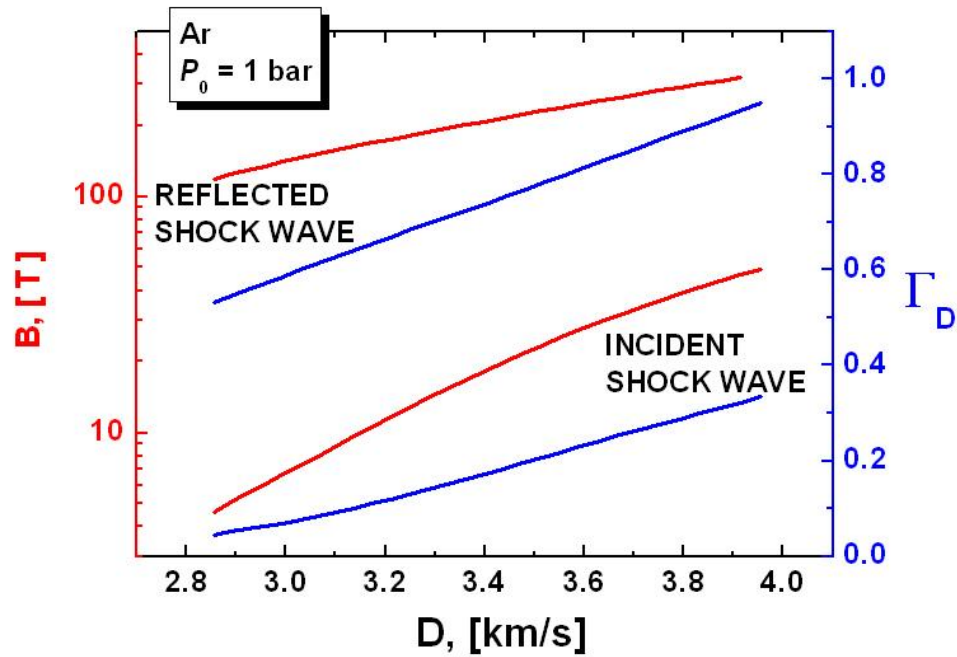
RESTRICTED CONDUCTOR
(THIN WIRE)



UNLIMITED CONDUCTOR
(CORBINO DISC)

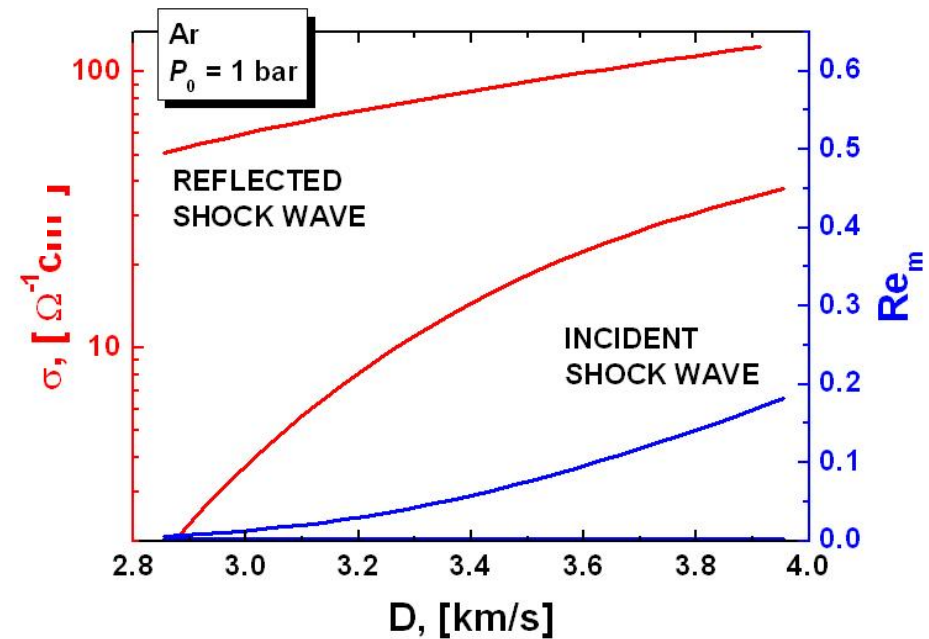


CULCULATIONS OF MAGNETIZED CONDITIONS

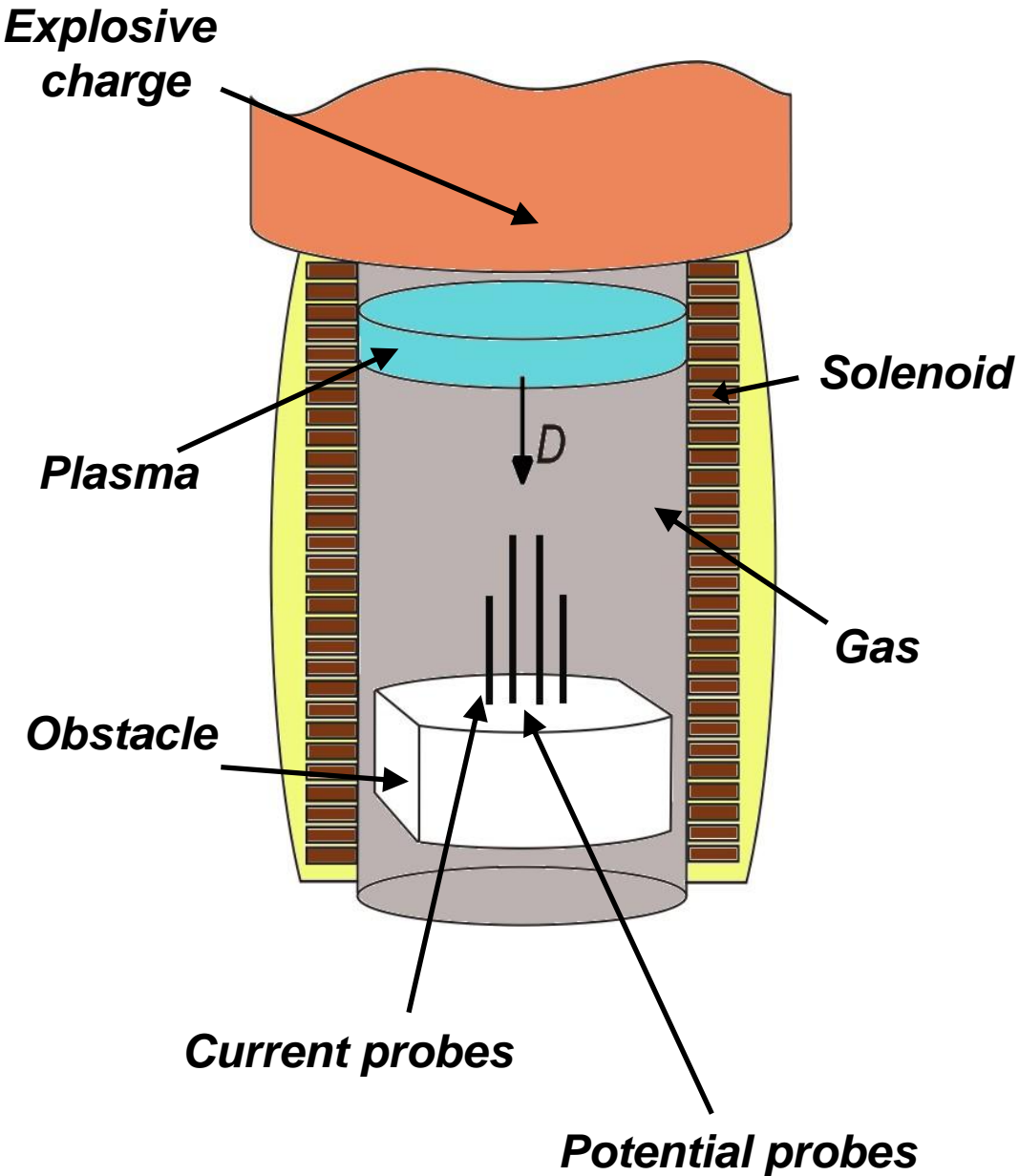


Parameter of magnetization

$$\omega\tau \geq 1$$



EXPLOSIVE GENERATOR



PARAMETRES OF PLASMA

$$D = 2 - 4 \text{ km/s}$$

$$P = 100 - 200 \text{ bar}$$

$$T = 8000 - 13000 \text{ K}$$

$$\Gamma_D = 0,05 - 0,4$$

$$\sigma = 1 - 30 \text{ } \Omega^{-1}\text{cm}^{-1}$$

MAGNETIC FIELD

$$B = 10 - 30 \text{ T}$$

ELECTRICAL CIRCUIT

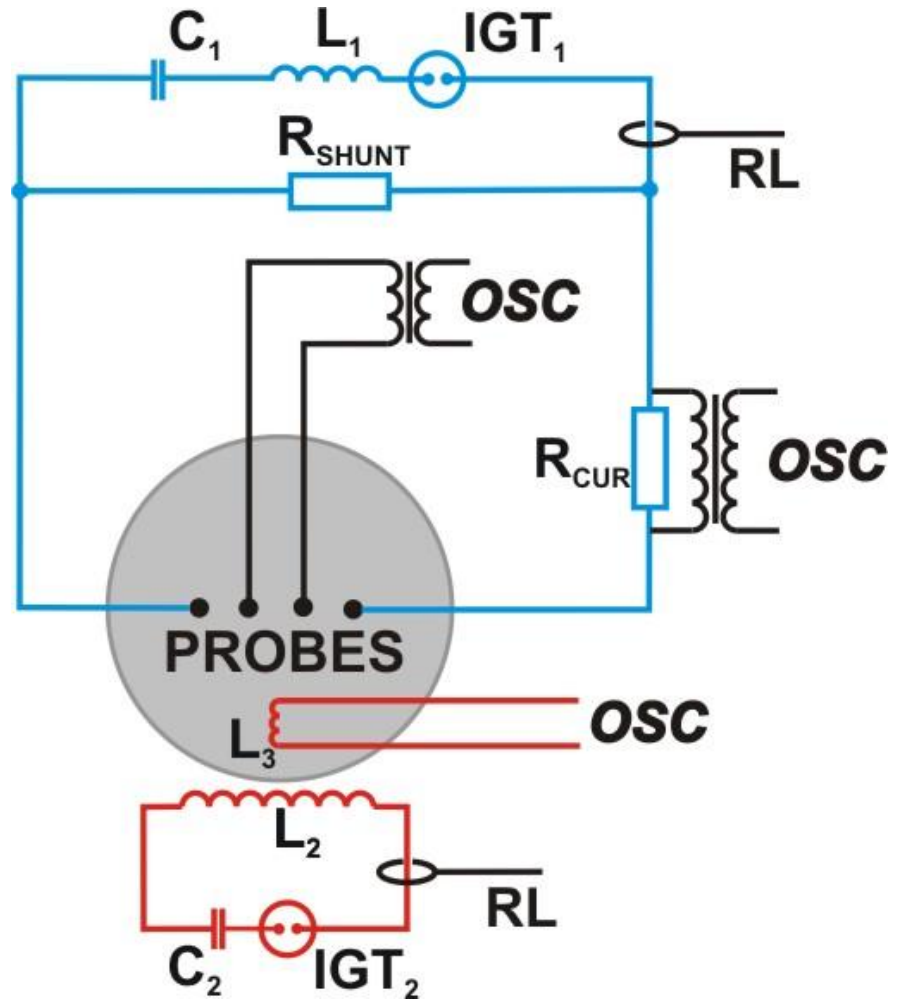
CIRCUIT FOR TRANSPORT CURRENT

- C_1 – Capacitor bank
- L_1 – Inductance
- IGT_1 – Ignitron

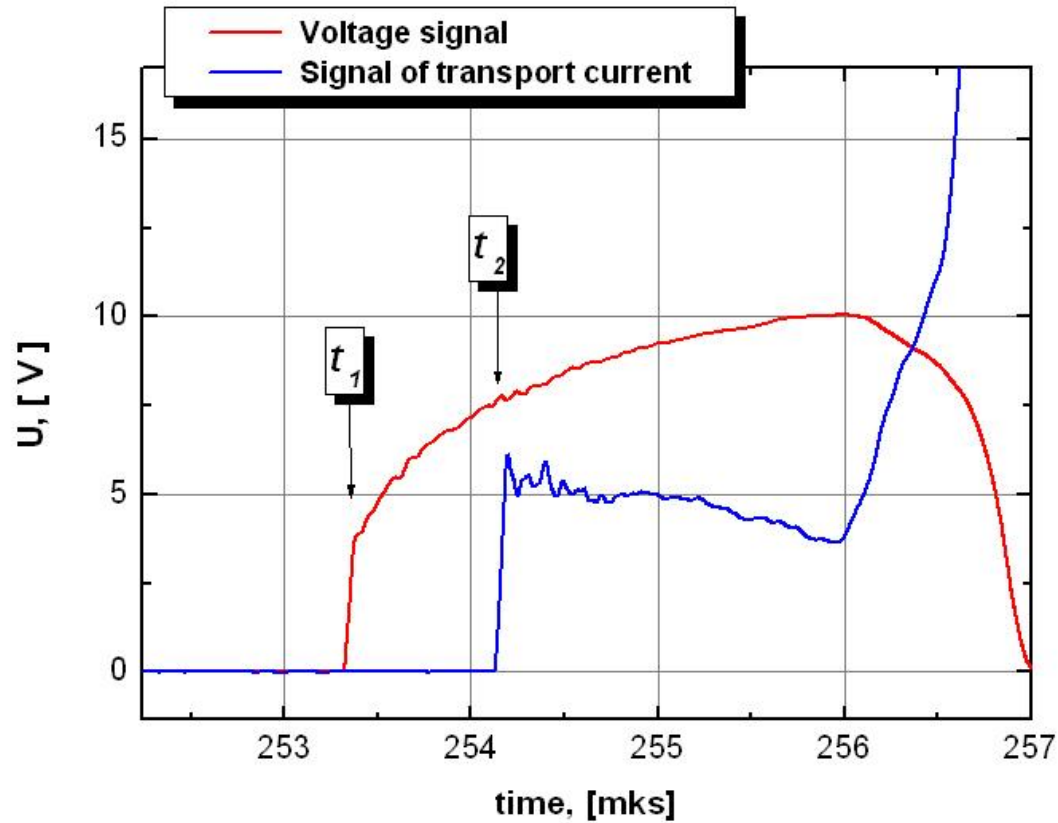
PLASMA

SOLENOID CIRCUIT

- C_2 – Solenoid's capacitor
- L_2 – Solenoid
- L_3 – Inductive coil
- IGT_2 – Ignitron
- RL – Rogovsky loop



EXPERIMENTAL OSCILLOGRAM



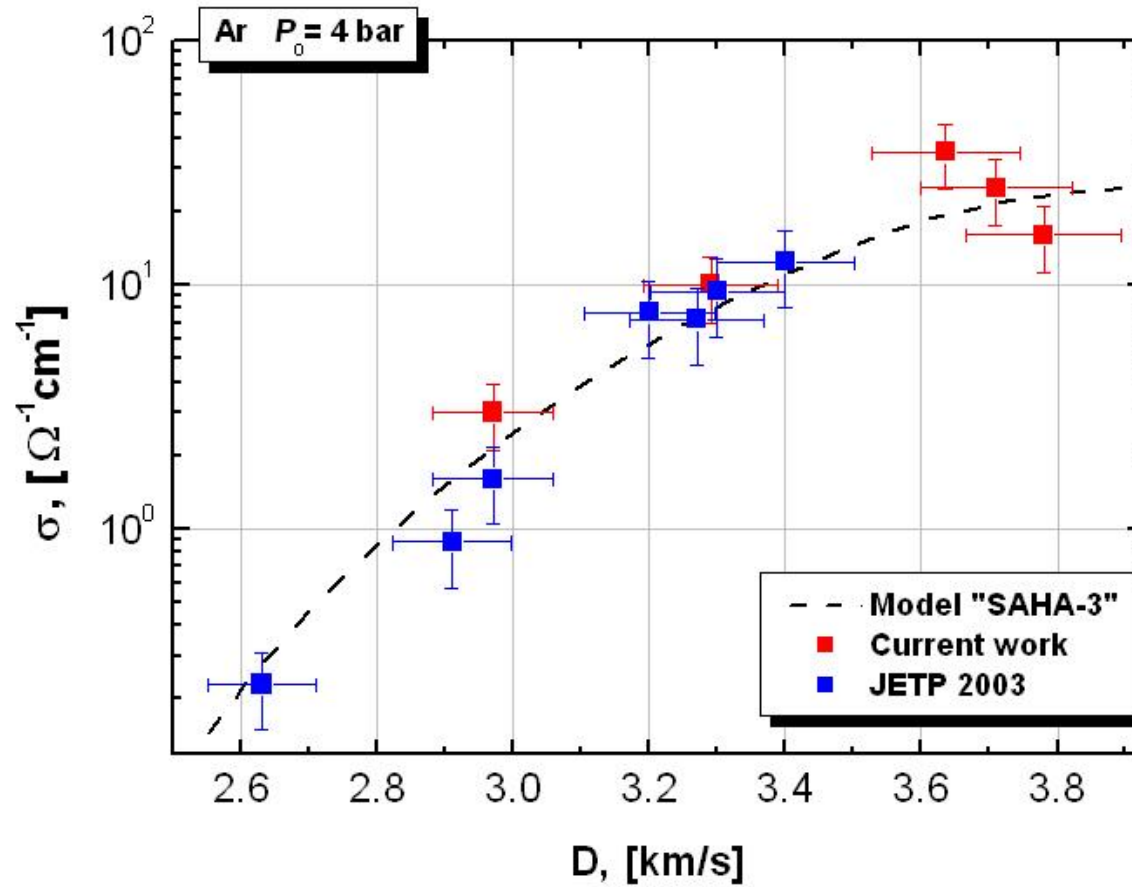
t_1 – Plasma arrival at the transport probes

Conductivity under the incident wave

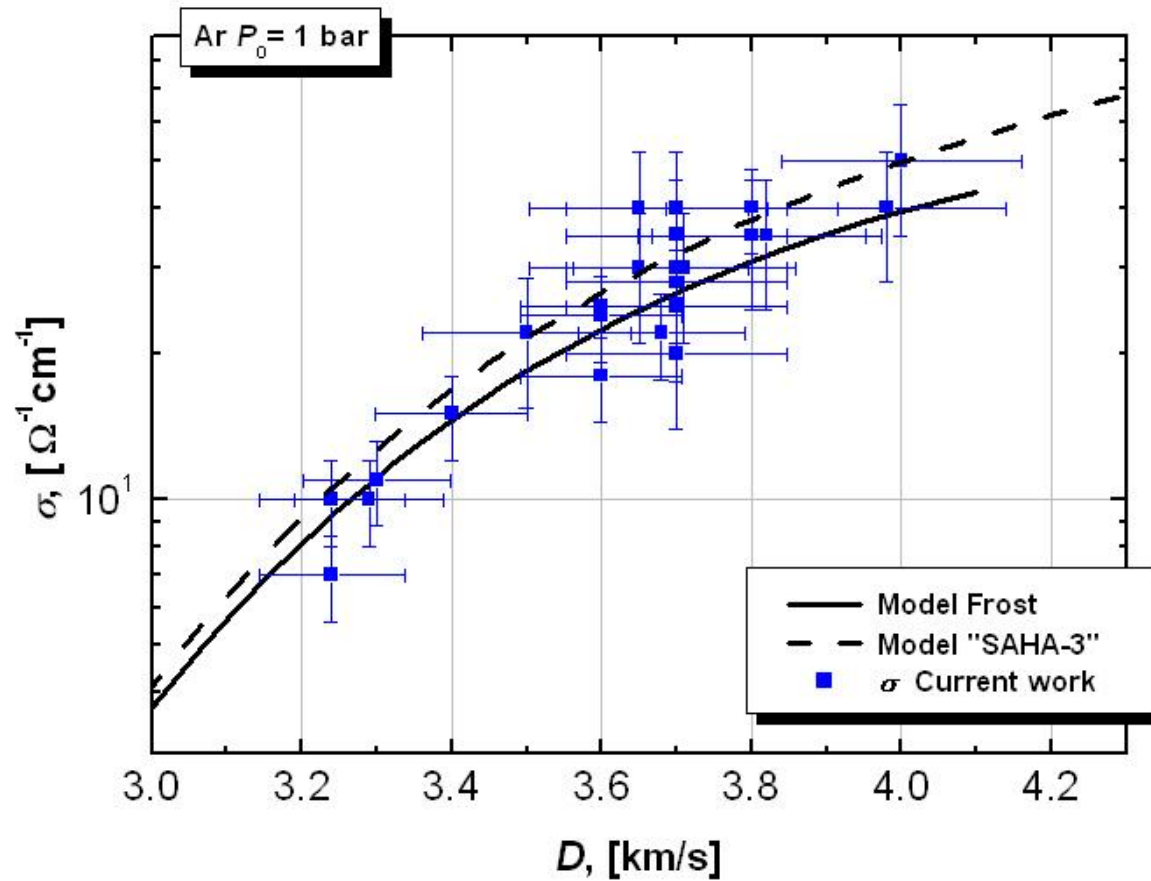
t_2 – Plasma arrival at the potential probes

$$\sigma_1 = \frac{I(t)Q}{U(t)h_1(t)}$$

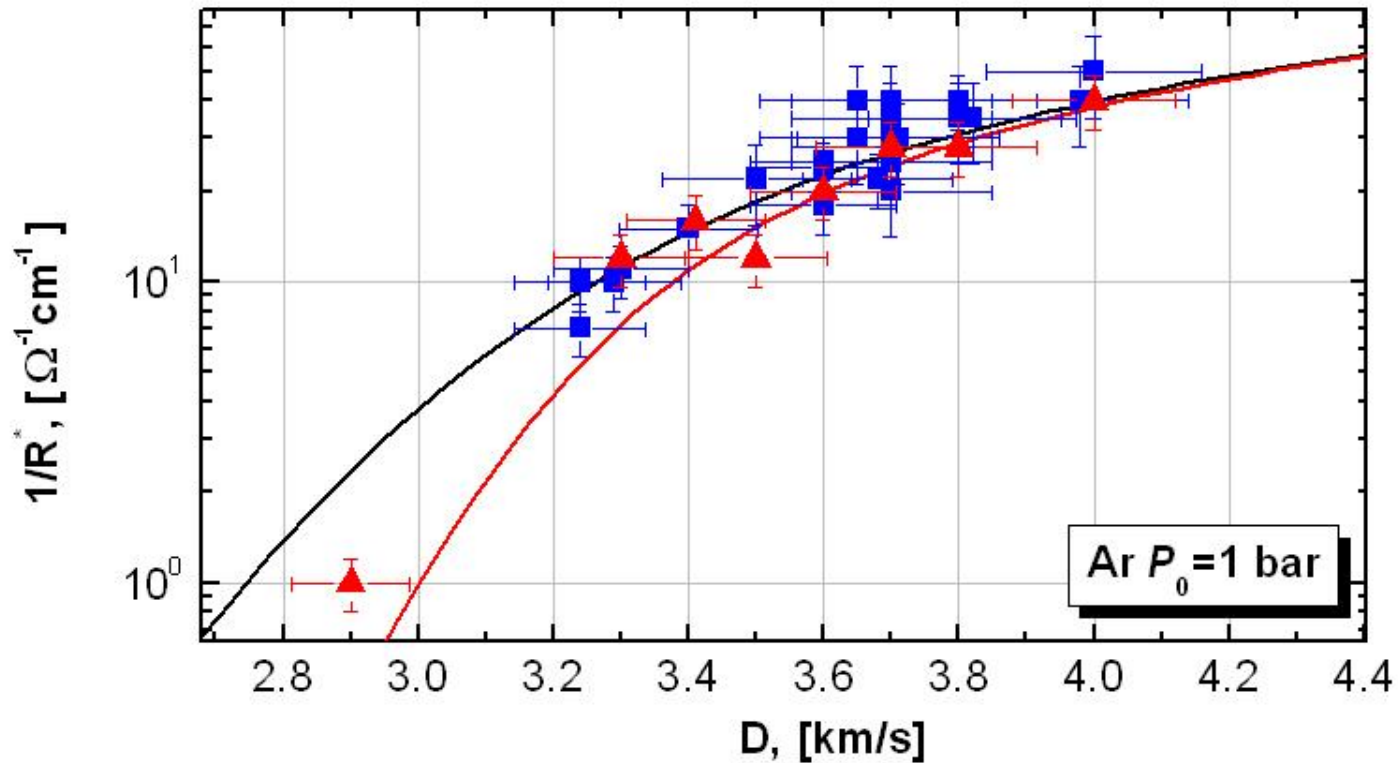
CONDUCTIVITY OF ARGON PLASMA WITH $P_0=4$ bar



CONDUCTIVITY OF ARGON PLASMA WITH $P_0 = 1$ bar



MAGNETORESISTANCE OF ARGON PLASMA



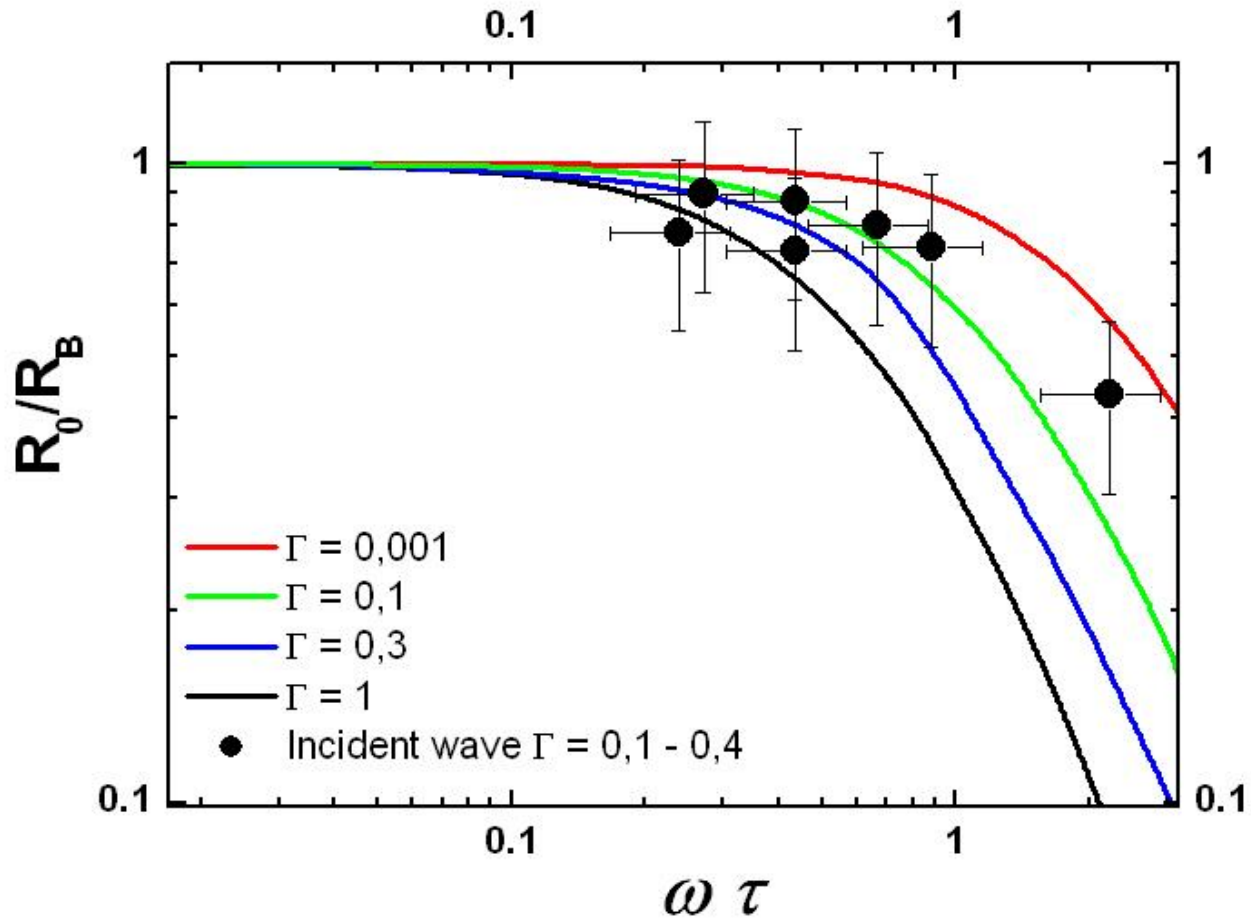
— Calculation without magnetic field ($B=0$)

— Calculation in magnetic field ($B=17$ T)

■ Our experiments ($B=0$)

▲ Our experiments ($B=17$ T)

MAGNETORESISTANCE OF ARGON PLASMA



CONCLUSION

- New results on magnetoresistance of shock-compressed argon plasma in a transverse magnetic field up to 17 T are carry out. Plasma is investigated in parameters: $P = 100\text{--}200$ bar, $T = 8000\text{--}13000$ K, $\Gamma_D = 0,05\text{--}1$
- The obtained results are compared with transport theories of plasma with strong inter particle interaction