2A

DME gas:

• DME gas gives a plane inefficiency of $< 5\cdot10^{-4}$ (measured inefficiency was $\cong 5\cdot10^{-5}$) and provides reliable reconstruction of a positron helix with correct confidence level of > 0.5 using with "sliding method". The $5\cdot10^{-4}$ inefficiency provides probability of $0.7\cdot10^{-5}$ to loss 2 points on a helix, that is less than statistical error of 10^{-5} at total statistic of 10^{10}.

• Maximal value of Lorentz drift angle is 8.5° in DME gas at B = 2T (it is minimal value for all known gases). It provides an energy shift at reconstruction of < 1keV (NIM A396 (1997) 135-146, Fig.13) if we know the Lorentz angle with accuracy of 30% (+/- 3°). Let me remark that the Lorentz angle has been measured with accuracy of 5% in DME gas at B = 2T and electrical field E > 2kV/cm (NIM A287 (1990) 273-276). GARFIELD program calculates the Lorentz angle with accuracy of > 15%.

• DME gas is a good quencher therefore a possible crosstalk between adjacent wires because UV is insignificant.

• Chamber aging with DME gas has been measured taking to account all materials using for our chamber production. No sufficient gain reducing (> 10%) at about 0.5C/cm of accumulated charge. A maximal contribution to the damage gives surface muon beam in a central area (inside 2cm diameter). It is about 0.1C/cm at total statistics of 10^{11}.

CO_2 based gas:

• Pure CO_2 gas gives 35 primary electrons per cm compare with 60 for DME (CERN – PPE/94-1, May 18, 1994). Some admixtures to CO_2 will not change that number sufficiently. Some concern appears therefore about possibility to provide a chamber inefficiency $< 5\cdot10^{-4}$.

• Pure CO_2 gas has Lorentz drift angle ≅ 18° at B =2T (NIM A367 (1995) 306-310). (It is my estimation only because the angle value has been measured at B = 0.5, 1.0, and 1.4T). No experimental data about Lorentz drift value in CO_2 at B = 2T and 0 < E < 20kV/cm (real E range in our cell). Some concern appears about possibility to reconstruct a positron momentum without systematic shift. Addition of any admixture to the pure CO_2 will increase the Lorentz drift angle.

• Pure CO_2 is not so good quencher of UV compare with DME, therefore some concern appears about a big crosstalk value using CO_2. Any quencher (for example, iC_4H_{10}) will improve the quenching.

• Aging of any materials is less with CO_2 than with DME.

Conclusion:

Measurements of chamber inefficiency, Lorentz drift angle and crosstalk value have to be done with acceptable accuracy in order to approve CO_2 based gas for TWIST detector.

2D

Existing 1AT1 target quality has been investigated in the above Strovink experiments and in our tests. Some disadvantages of the target are:

• Surface muon source from the target has a long tail in horizontal plane because proton beam sees side surface of the target. It increases momentum spread and the beam emittance, and increases therefore a shift of P_μ and muon spin depolarization in fringe field.

• Cloud muon admixture is about 1.5% (Phys. Rev. D39 (1986) 1967-1990). No estimation of possible cloud muon admixture on level of $< 10^{-3}$ inside selected time range between RF pulses. The cloud muons have $P_\mu = 0.3$ instead of $P_\mu = -1$ for surface muons, therefore a possible 10^{-3} cloud muon admixture gives practically the same shift to P_μ value.

• Geometrical shift of proton beam position on the 1AT1 in horizontal direction will change beam momentum and angle of beam, and change therefore center of gravity of muon stops in stopping target along Z axis and muon depolarization in fringe field.

We proposed to rotate the existing 1AT1 target in horizontal plane on 45°. Long side of the target will be parallel to M13 axis, and front side will be orthogonal to M13 axis. In result the M13 will see only front surface of the target. Some possible advantages of the target:

• The target has restricted size in horizontal direction and M13 has lower emittance, and provides therefore lower momentum spread and muon spin depolarization in fringe field.

• Surface muon rate depends on visible by M13 surface. Cloud muon rate depends on visible by M13 volume of the target. Ratio (visible surface/visible volume) will sufficiently lower for the proposed target than for existing one. We hope to reduce the existing cloud muon admixture of 1.5% to exclude a possible influence of long tail of cloud muon time distribution on P_μ value.

• Geometrical shift of proton beam position in any direction does not shift surface beam momentum.