STATS — *Specialist Engineering, Materials and Environmental Consultants*

BOREHOLE RECORD (Rotary)

Borehole Number: **BH101**

Site: Denmark Place

Easting: 529867.9

Northing: 181290.3

Client: Consolidated Developments Limited

Ground Level: 25.10mAOD

Dates: 8 Apr 08 – 15 May 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD** | Sheet 4 of 7

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
							30.10	-5.00		Stiff locally thinly laminated closely to very closely fissured grey CLAY with occasional shiny speckles <1mm of selenite and occasional light grey silt partings <1mm. (LONDON CLAY)
	D33 30.20	S N=49					30.25	-5.15		
							30.50	-5.40		
	U23 30.85 D34 30.90			83			31			Very stiff grey mottled dark green grey CLAY with occasional rounded fine to medium flint and occasional dark grey silt partings to 2mm. (LONDON CLAY BASAL BEDS)
										Very stiff green grey mottled orange brown CLAY with many white powdery shell fragments. (UPPER SHELLY BEDS, LAMBETH GROUP)
	D35 31.70	S 50/215mm					32			Hard and friable locally very stiff red brown mottled green grey CLAY with occasional partings of green grey clay and green grey slightly sandy silt. Sand is fine. (UPPER MOTTLED BEDS, READING FORMATION, LAMBETH GROUP)
	D36 32.10 U24 32.20			97						
	U25 32.80						33			…between 32.7m and 35.0m depth, with many partings and thin to very thin beds of green grey very silty fine sand.
	D37 33.20	S 50/190mm								
	U26 33.75			100			34			
	D38 34.50									
	U27 34.75			80			35			
				80						
	D39 36.00	S 39/200mm					36			
				120						
							37			
							37.15	-12.0		
	D40 37.20			100						Very stiff locally hard and friable locally thinly laminated mid to dark grey CLAY (UPPER MOTTLED BEDS, READING FORMATION, LAMBETH GROUP)
				94			38			
	D41 38.60			100						
							38.85	-13.7		
				100			39			Hard (locally very stiff) closely to extremely closely fissured locally thinly laminated multicoloured (purple, grey, red brown, orange) CLAY with occasional thin beds to thick laminae of very silty fine sand. (UPPER MOTTLED BEDS, READING FORMATION, LAMBETH GROUP)
		S 50/275mm		NR						…between 39.0m and 39.3m depth, with some powdery white partings to 2mm - probably disintegrated shell fragments
	D42 39.80 U28 39.85									***Continued next sheet***

Remarks and Water Observations

Hand dug inspection pit to 1.50m - no services encountered. Cable percussion BH diameter 200mm to 7.60m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 4.40 - 6.00m. Water encountered at 5.60m depth - no rise. Casing left in the hole for rotary follow on. Geobore S rotary cored with water from 7.10m to 63.50m depth.

Scale: 1:50

Logged by: JB

Figure: A1

STATS — *Specialist Engineering, Materials and Environmental Consultants*

BOREHOLE RECORD (Rotary)

Borehole Number: **BH101**

Site: Denmark Place

Easting: 529867.9

Northing: 181290.3

Client: Consolidated Developments Limited

Ground Level: 25.10mAOD

Dates: 8 Apr 08 – 15 May 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD** | Sheet 5 of 7

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
	U29 40.30			100						Hard (locally very stiff) closely to extremely closely fissured locally thinly laminated multicoloured (purple, grey, red brown, orange) CLAY with occasional thin beds to thick laminae of very silty fine sand. (UPPER MOTTLED BEDS, READING FORMATION, LAMBETH GROUP)
	D43 40.60	S 50/155mm					41			
				100			41.30	-16.2		Very dense thinly interlaminated light grey and light brown slightly silty fine SAND. (LAMINATED BEDS, WOOLWICH FORMATION, LAMBETH GROUP)
							42			
	D44 42.20									
	U31 42.25			97						
	U30 42.95						43			
	D45 43.70	S 50/30mm								
				67			44			
	D46 44.80									
	D47 45.10						45			
	U32 45.20						45.10	-20.0		Very dense locally thinly laminated dark grey brown clayey fine SAND. (LAMINATED BEDS, WOOLWICH FORMATION, LAMBETH GROUP)
							45.50	-20.4		Hard indistinctly fissured locally thinly to thickly laminated multicoloured (mottled green grey, grey green, purple, red brown and orange brown) sandy CLAY with occasional fine sand pockets and partings to 5mm. Sand is fine. (LOWER MOTTLED BEDS, READING FORMATION, LAMBETH GROUP)
	U33 45.90			100			46			…below 46.3m depth, with occasional dark green glauconitic sand within clay and within sand pockets and partings
	D48 46.60	S 48/160mm								…at 46.5m depth, 20mm rounded flint pebble
							47.05	-21.9		Very dense thinly interbedded to thinly interlaminated clayey dark grey mottled dark green fine SAND and light grey silty fine SAND. (UPNOR FORMATION, LAMBETH GROUP)
	D49 47.70			100						
	U34 47.75						48			…between 47.85m and 47.95m depth, with subrounded to rounded fine to coarse flint gravel washed out of matrix
				57						…between 48.1m and 48.35m depth, with subrounded to rounded fine to coarse flint gravel washed out of matrix
							48.80	-23.7		Very dense dark green grey silty fine SAND. (THANET SAND)
							49			…between 48.80m and 49.20m depth, no recovery
	D50 49.25			31						
				NR						
		S								***Continued next sheet***

Remarks and Water Observations

Hand dug inspection pit to 1.50m - no services encountered. Cable percussion BH diameter 200mm to 7.60m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 4.40 - 6.00m. Water encountered at 5.60m depth - no rise. Casing left in the hole for rotary follow on. Geobore S rotary cored with water from 7.10m to 63.50m depth.

Scale: 1:50

Logged by: JB

Figure: A1

STATS — *Specialist Engineering, Materials and Environmental Consultants*

BOREHOLE RECORD (Rotary)

Borehole Number: **BH101**

Site: Denmark Place

Easting: 529867.9

Northing: 181290.3

Client: Consolidated Developments Limited

Ground Level: 25.10mAOD

Dates: 8 Apr 08 – 15 May 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD** | Sheet 6 of 7

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
		50/45mm		NR						Remaining Detail : 49.70m - 49.70m : …between 49.7m and 50.65m depth, no recovery
				43			51			…between 50.65m and 51.05m depth, subrounded to rounded medium to coarse flint and hard green grey speckled black clay - pushed down from above when rods removed and redrilled
	B8 51.30	S 50/50mm		100						…between 51.05m and 51.20m depth, very disturbed recovery
	U35 51.50			83						
	U36 52.05			100			52			
	B9 52.50			71						
				NR			52.80	-27.7		No recovery - large flint cobbles (BULLHEAD BEDS)
				14			53			…between 53.10m and 55.50m depth, poor recovery due to flints pushed down at end of coring bit.
							53.50	-28.4		Weak to moderately strong, medium density, white CHALK. Fractures are near horizontal, closely to extremely closely spaced (10,40,180) infilled (1,2,3) with white comminuted chalk. GRADE B/1,2,3
				20			54			
							55			
	C1 55.73	S 50/95mm	11	73	27	27	56			…between 55.90m and 56.10m depth, no recovery
			20							
				100	35	35				
			23				57			…between 57.0m and 57.35m depth, non intact due to SPT
		S 50/115mm					57.30	-32.2		
	C2 57.42		5	93	52	45				Moderately weak to strong, medium density white with frequent pale grey staining CHALK. Fractures medium to closely spaced (100,275,500) tight, clean (1,2,3) to infilled with grey clay/smear or slightly stained orange brown. (GRADE A,B/2,3)
							58			…between 58.10m and 58.50m, poor recovery with subangular to subrounded flint cobbles up to 100mm.
	C3 58.95		6	93	80	61	59			
	C4 59.45									

Continued next sheet

Remarks and Water Observations

Hand dug inspection pit to 1.50m - no services encountered. Cable percussion BH diameter 200mm to 7.60m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 4.40 - 6.00m. Water encountered at 5.60m depth - no rise. Casing left in the hole for rotary follow on. Geobore S rotary cored with water from 7.10m to 63.50m depth.

Scale: 1:50

Logged by: JB

Figure: A1

STATS

Specialist Engineering, Materials and Environmental Consultants

BOREHOLE RECORD (Rotary)

Borehole Number **BH101**

Site: Denmark Place

Easting: 529867.9

Northing: 181290.3

Client: Consolidated Developments Limited

Ground Level: 25.10mAOD

Dates: 8 Apr 08 – 15 May 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD** | Sheet 7 of 7

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
	C5 60.30	S 50/50mm	7	93	57	50	61			Remaining Detail : 59.70m - 59.70m : …between 59.70m and 59.90m depth, with 180mm long rinded flint cobble …between 60.60m and 60.88m depth, rinded flint cobbles
	C6 61.50		8							
	C7 62.32		3	93	85	83	62			…at 61.20m depth, 50mm flint cobble …below 61.30m depth, moderately strong to strong, very high density …below 61.57m depth, fractures are widely to closely spaced (GRADE A,B/1,2,3)
	C8 63.00		4	88	88	70	63			…between 62.60m and 62.72m depth, rinded angular fine to coarse flint gravel and cobbles in comminuted chalk matrix
							63.50	-38.4		***End of Borehole at 63.50 m***
							64			
							65			
							66			
							67			
							68			
							69			

Remarks and Water Observations

Hand dug inspection pit to 1.50m - no services encountered. Cable percussion BH diameter 200mm to 7.60m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 4.40 - 6.00m. Water encountered at 5.60m depth - no rise. Casing left in the hole for rotary follow on. Geobore S rotary cored with water from 7.10m to 63.50m depth.

Scale: 1:50

Logged by: JB

Figure: A1

STATS — *Specialist Engineering, Materials and Environmental Consultants*

BOREHOLE RECORD (Rotary - Open Hole)

Borehole Number: **BH102**

Site: Denmark Place

Easting: 529866.3

Northing: 181289.8

Client: Consolidated Developments Limited

Ground Level: 25.11mAOD

Dates: 9 Apr 08 – 25 Apr 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD** | Sheet 1 of 6

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
							0.05	25.06		MADE GROUND: Tarmac.
	J1 0.30 TB1 B1 0.50 J2 TB2 0.70 D1						0.25	24.86		MADE GROUND: Grey unreinforced concrete.
							0.50	24.61		MADE GROUND: Brown silty very sandy angular to subangular fine to coarse gavel of brick fragments with occasional whole bricks, concrete fragments, flint and coal. Sand is fine to coarse.
	B2 1.40 J3 TB3 1.60 D2 B3	S N=1					1			MADE GROUND: Soft to firm dark brown slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is angular to subangular fine to coarse brick and concrete with occasional coal fragments, clay cigarette pipes and animal bones. …below 1.40m depth, mottled orange brown.
	U1 2.50 J4 TB4						2			
	D3 2.95 B4 3.00 D4	S N=25					3			
							3.20	21.91		MADE GROUND: Firm orange brown slightly sandy gravelly clay. Sand is fine to coarse. Gravel is angular to subangular fine to coarse flint with occasional red brick fragments.
	J5 3.50 TB5 3.60 D5						3.50	21.61		Very dense brown slightly silty sandy angular to subrounded fine to coarse flint GRAVEL. Sand is medium to coarse. (RIVER TERRACE DEPOSITS)
	B5 4.00 D6	S N=50					4			
	J6 4.50 TB6						5			…below 5.00m depth, dense.
	B6 5.00	C N=48								
	J7 5.50 TB7						6			
	D7 6.00						6.00	19.11		Firm locally thinly laminated orange brown CLAY with occasional dark brown/black laminae <1mm. (LONDON CLAY)
	U2 6.20 J8 TB8						6.50	18.61		Firm (locally stiff) indistinctly fissured locally thinly laminated grey CLAY with occasional shiny speckles <1mm of selenite and occasional partings up to 1mm of light grey silt. (LONDON CLAY)
	D8 6.60 D9 6.65	S N=21					7			
							7.50	17.61		(LONDON CLAY)
							8			
		S N=19					9			…between 9.00m and 9.45m depth, stiff grey CLAY with occasional shiny speckles <1mm of selenite.
										Continued next sheet

Remarks and Water Observations

Hand dug inspection pit to 1.60m - no services encountered. Cable percussion BH diameter 200mm to 7.50m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 3.50 - 6.00m. Water 10/04/08 pm, 4.40m, 11/04/08 am 4.00m, casing at 5.00m. Casing left in the hole for rotary follow on. Open holed using water to 54.00m depth for 9 in-situ pressure metre tests. Strata boundaries inferred from Driller's Descriptions and from BH101 strata.

Scale: 1:50

Logged by: JB

Figure: A1

STATS

Specialist Engineering, Materials and Environmental Consultants

BOREHOLE RECORD (Rotary - Open Hole)

Borehole Number **BH102**

Site: Denmark Place

Easting: 529866.3

Northing: 181289.8

Client: Consolidated Developments Limited

Ground Level: 25.11mAOD

Dates: 9 Apr 08 – 25 Apr 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD**

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
		S N=27					11 12 13 14 15 16 17 18 19			(LONDON CLAY) …between 14.50m and 14.95m depth, stiff grey CLAY with occasional shiny speckles <1mm of selenite. …between 16.80m and 17.10m depth, suspected 'CLAYSTONE' (Driller's Description) ***Continued next sheet***

Remarks and Water Observations

Hand dug inspection pit to 1.60m - no services encountered. Cable percussion BH diameter 200mm to 7.50m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 3.50 - 6.00m. Water 10/04/08 pm, 4.40m, 11/04/08 am 4.00m, casing at 5.00m. Casing left in the hole for rotary follow on. Open holed using water to 54.00m depth for 9 in-situ pressure metre tests. Strata boundaries inferred from Driller's Descriptions and from BH101 strata.

Scale: 1:50

Logged by: JB

Figure: A1

STATS

Specialist Engineering, Materials and Environmental Consultants

BOREHOLE RECORD (Rotary - Open Hole)

Borehole Number **BH102**

Site: Denmark Place

Easting: 529866.3

Northing: 181289.8

Client: Consolidated Developments Limited

Ground Level: 25.11mAOD

Dates: 9 Apr 08 – 25 Apr 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD**

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
		S N=37					21			(LONDON CLAY) …between 20.50m and 20.95m depth, very stiff grey CLAY with occasional shiny speckles <1mm of selenite.
							22			
							23			
							24			
							25			
							26			
		S N=37					27			…between 26.50m and 36.95m depth, very stiff grey CLAY with occasional shiny speckles <1mm of selenite)
							28			
							29			

Continued next sheet

Remarks and Water Observations

Hand dug inspection pit to 1.60m - no services encountered. Cable percussion BH diameter 200mm to 7.50m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 3.50 - 6.00m. Water 10/04/08 pm, 4.40m, 11/04/08 am 4.00m, casing at 5.00m. Casing left in the hole for rotary follow on. Open holed using water to 54.00m depth for 9 in-situ pressure metre tests. Strata boundaries inferred from Driller's Descriptions and from BH101 strata.

Scale: 1:50

Logged by: JB

Figure: A1

STATS

Specialist Engineering, Materials and Environmental Consultants

BOREHOLE RECORD (Rotary - Open Hole)

Borehole Number **BH102**

Site: Denmark Place

Easting: 529866.3

Northing: 181289.8

Client: Consolidated Developments Limited

Ground Level: 25.11mAOD

Dates: 9 Apr 08 – 25 Apr 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD**

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
										(LONDON CLAY)
							30.25	-5.14		(UPPER SHELLY BEDS, LAMBETH GROUP)
							30.50	-5.39		(UPPER MOTTLED BEDS, READING FORMATION, LAMBETH GROUP)
		S 50/145mm					31			…33.50m and 33.73m depth, very stiff to hard red brown mottled light blue grey CLAY)
							32			
							33			
							34			
							35			
							36			
							37			
							38			
							39			

Continued next sheet

Remarks and Water Observations

Hand dug inspection pit to 1.60m - no services encountered. Cable percussion BH diameter 200mm to 7.50m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 3.50 - 6.00m. Water 10/04/08 pm, 4.40m, 11/04/08 am 4.00m, casing at 5.00m. Casing left in the hole for rotary follow on. Open holed using water to 54.00m depth for 9 in-situ pressure metre tests. Strata boundaries inferred from Driller's Descriptions and from BH101 strata.

Scale: 1:50

Logged by: JB

Figure: A1

STATS

Specialist Engineering, Materials and Environmental Consultants

BOREHOLE RECORD (Rotary - Open Hole)

Borehole Number **BH102**

Site: Denmark Place

Easting: 529866.3

Northing: 181289.8

Client: Consolidated Developments Limited

Ground Level: 25.11mAOD

Dates: 9 Apr 08 – 25 Apr 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD**

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
										(UPPER MOTTLED BEDS, READING FORMATION, LAMBETH GROUP)
							41			
							41.30	-16.2		(LAMINATED BEDS, WOOLWICH FORMATION, LAMBETH GROUP)
							42			
							43			
		S 50/30mm								…between 43.50m and 43.60m depth, very dense thinly laminated light grey and light brown silty fine SAND.
							44			
							45			
							45.50	-20.4		(LOWER MOTTLED BEDS, READING FORMATION, LAMBETH GROUP)
							46			
							47			
							47.05	-21.9		(UPNOR FORMATION, LAMBETH GROUP)
		S 50/163mm								…between 47.40m and 47.65m depth, very dense green fine to coarse glauconitic SAND over very stiff brown grey thinly laminated CLAY with silt laminae.
							48			
							48.80	-23.7		…between 48.65m and 48.82 m depth, gravel band - 50% flush lost (Driller's Description)
							49			(THANET SAND)
		S 50/50mm								…between 49.45m and 49.61m depth, very dense grey slightly silty fine SAND.

Continued next sheet

Remarks and Water Observations

Hand dug inspection pit to 1.60m - no services encountered. Cable percussion BH diameter 200mm to 7.50m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 3.50 - 6.00m. Water 10/04/08 pm, 4.40m, 11/04/08 am 4.00m, casing at 5.00m. Casing left in the hole for rotary follow on. Open holed using water to 54.00m depth for 9 in-situ pressure metre tests. Strata boundaries inferred from Driller's Descriptions and from BH101 strata.

Scale: 1:50

Logged by: JB

Figure: A1

STATS

Specialist Engineering, Materials and Environmental Consultants

BOREHOLE RECORD (Rotary - Open Hole)

Borehole Number **BH102**

Site: Denmark Place

Easting: 529866.3

Northing: 181289.8

Client: Consolidated Developments Limited

Ground Level: 25.11mAOD

Dates: 9 Apr 08 – 25 Apr 08

Job No.: 36237

BOREHOLE | **CORE SAMPLES** | **STRATA RECORD**

Strike & Well	Samples & Testing	SPT 'N' Value	FI (per m)	TCR (%)	SCR (%)	RQD (%)	Depth (m)	Level (mAOD)	Key	Description
										(THANET SAND)
							52.85	-27.7		(WHITE CHALK)
							53.30	-28.2		(WHITE CHALK)
							54.00	-28.9		***End of Borehole at 54.00 m***

51 52 53 54 55 56 57 58 59

Remarks and Water Observations

Hand dug inspection pit to 1.60m - no services encountered. Cable percussion BH diameter 200mm to 7.50m depth and casing diameter 200mm to 7.00m depth. 30 gallons water added 3.50 - 6.00m. Water 10/04/08 pm, 4.40m, 11/04/08 am 4.00m, casing at 5.00m. Casing left in the hole for rotary follow on. Open holed using water to 54.00m depth for 9 in-situ pressure metre tests. Strata boundaries inferred from Driller's Descriptions and from BH101 strata.

Scale: 1:50

Logged by: JB

Figure: A1

APPENDIX A2

Core Photographs

(this appendix contains 20 pages including this one)

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

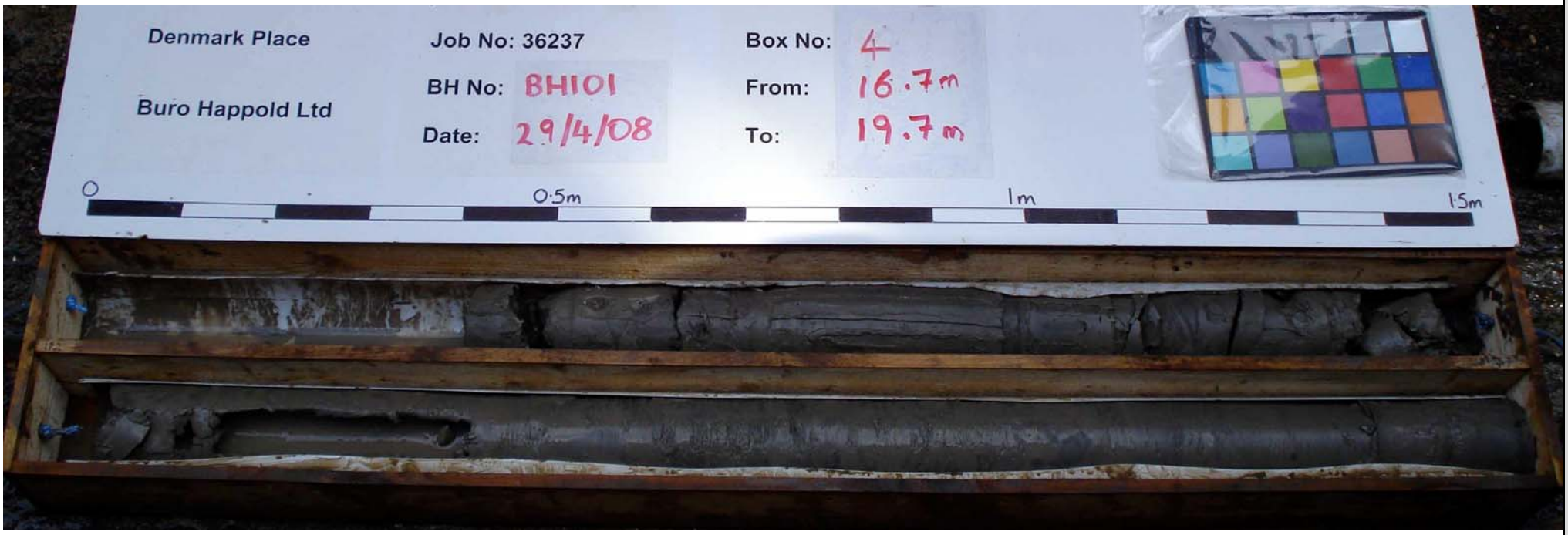
Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2



Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

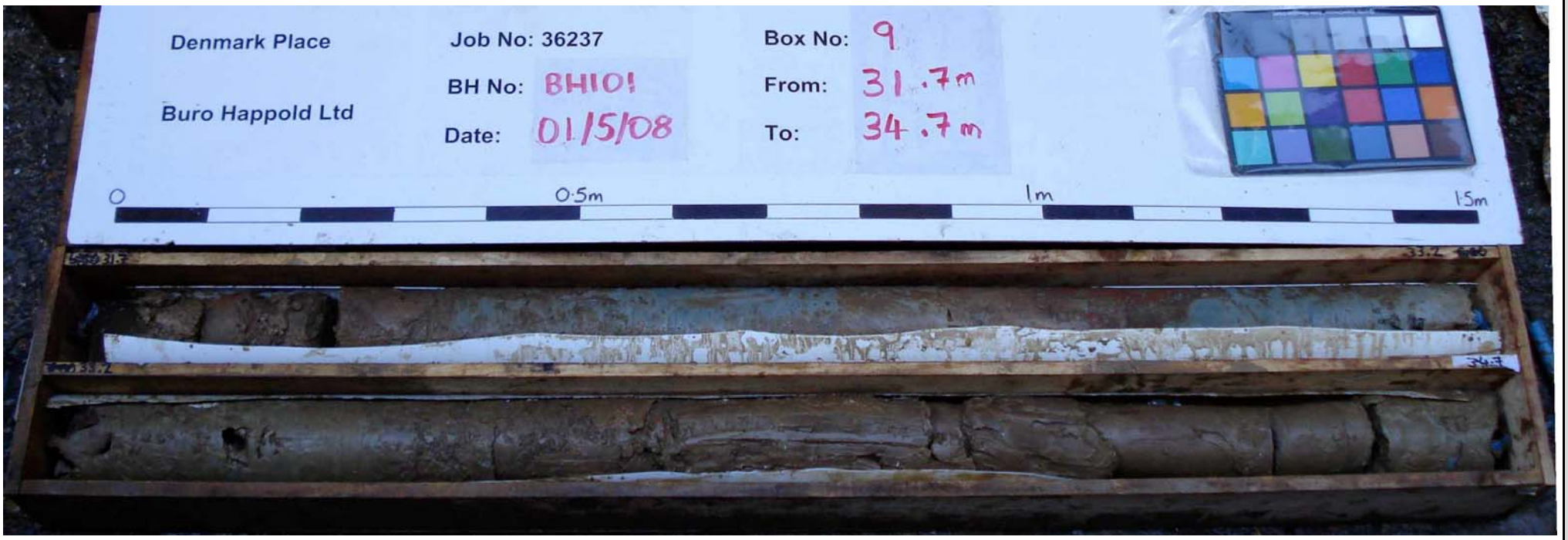
Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2



Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

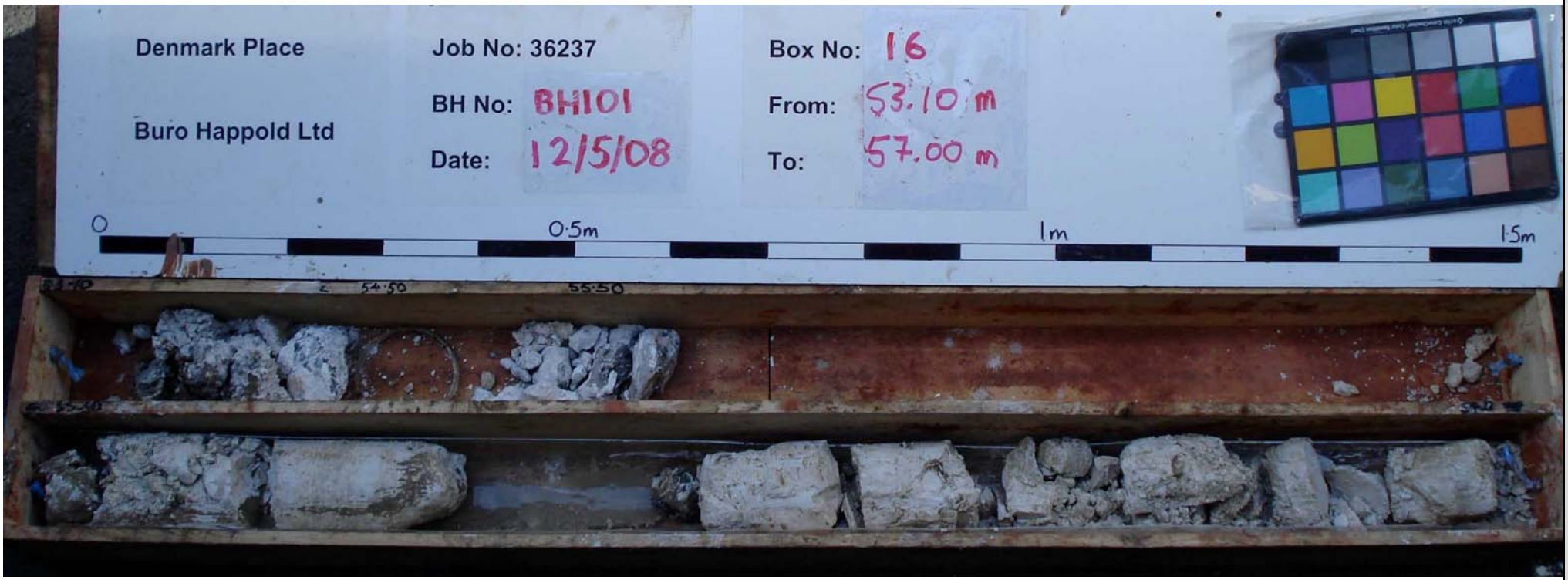
Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2



Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

Site:	Denmark Place	Client:	Consolidated Developments Limited
Source:	STATS	Scale:	Scale indicated within photograph

STATS

CORE PHOTOGRAPH

Job No:	36237
Fig No:	Appendix A2

APPENDIX A3

Cambridge Insitu Pressuremeter Testing Report and Data

(this appendix contains 1 CD and 1 page including this one)

DENMARK PLACE

GROUND INVESTIGATION

Results of self bored pressuremeter tests carried out by Cambridge Insitu Ltd

Our reference: **CIR1194**

Main contractor reference: **36237**

Report date: **June 2008**

Volume 2 of 2

Plots and data for tests in BH102

CAMBRIDGE INSITU LTD
Little Eversden
Cambridge
ENGLAND
CB23 1HE

Tel: +44 1223 262361
Fax: +44 1223 263947
Email: caminsitu@btconnect.com
HTTP: www.cambridge-insitu.com

Contents of Volume 2

Included tests

Test	Date	Depth	Probe	Remarks
		(mBGL)		
B102 T1	15-Apr-08	8.5	WRSBP6	London Clay
B102 T2	15-Apr-08	14.0	WRSBP6	London Clay
B102 T3	16-Apr-08	20.0	WRSBP6	London Clay
B102 T4	16-Apr-08	26.0	WRSBP6	London Clay
B102 T5	17-Apr-08	33.0	WRSBP6	Lambeth Group - reddish/grey clay
B102 T6	18-Apr-08	43.0	WRSBP6	Lambeth Group - layered sand/green clay
B102 T7	21-Apr-08	47.9	WRSBP6	Sandy gravely blue/green silt - probably Upnor Beds
B102 T8	22-Apr-08	50.0	WRSBP6	Thanet Sand - some gravel in the hole
B102 T9	22-Apr-08	51.0	WRSBP6	Thanet Sand - drilled on from test 8

This volume is laid out as follows:

a) A summary section showing various parameters plotted against depth. This starts with a plot showing the field curves of all tests on common axes of pressure and displacement.
b) A detailed presentation of the shear modulus information gathered from unload/reload cycles. Some of these are summary plots.

This is then followed by the analysis data for the individual tests. For each test there are the following pages in approximately the following order:

1. A Results Summary Sheet
2. A plot of Total pressure/Cavity strain
3. Where appropriate, a plot on axes of Average Radial Displacement/ Total pressure showing the choice of cavity reference pressure suggested by initial cavity movement ('Lift-off' analysis).
4. A plot on axes of Average Radial Displacement/ Total pressure showing the Marsland & Randolph (1977, modified) construction.
5. Where appropriate, a plot on axes of pore pressure vs total pressure showing the development of excess pore pressure during the test and identifying, where possible, the cavity reference pressure from the onset of cavity expansion.
6. For undrained tests, a plot on axes of Ln[current cavity shear strain]/Total Pressure showing loading data and the use of the perfectly plastic solution to obtain the undrained shear strength and limit pressure (after Gibson & Anderson, 1961)
7. A plot on axes of Ln[current cavity shear strain]/Total Pressure (unloading) showing contraction data and the use of the perfectly plastic solution to obtain the undrained shear strength (after Jefferies, 1987).
8. For undrained tests, a plot of shear stress vs shear strain for the expansion phase of the test using the procedure suggested by Palmer (1972).
9. For undrained tests, a plot of shear stress vs shear strain for the contraction phase of the test using the procedure suggested by Palmer (1972).
10. For drained tests, a plot on axes of Ln[cavity strain]]/Ln[Effective radial stress]showing the peak angle of internal friction and dilation (Hughes et al,

1977).

11. Plots on axes of Radial displacement/Total Pressure showing enlarged views of unload/reload cycles and quoting shear modulus G
12. Plots on axes of Ln[current cavity shear strain]/Ln[Total Pressure] showing loop reloading paths and quoting the gradient and intercept for each loop.
13. A plot on axes of secant shear modulus/Log[Shear strain] showing the decay of stiffness against strain curves derived from fitting a power law function to reloading data, all cycles. Individual data points obtained from applying Palmer (1972) directly to reloading data are also shown.
14. For undrained tests, a plot on axes of Average Cavity Strain/ Total pressure showing the results of curve fitting the field curve with the best set of parameters using a non-linear elastic/perfectly plastic solution (Whittle, '99).

If a drained test has been carried out:

15. Manassero, 1989 – A plot of effective radial stress vs cavity strain, showing the loading curve with the loops removed.
16. Manassero, 1989 – A plot of volumetric strain vs shear strain, loading and unloading data shown.
17. Manassero, 1989 – A plot of the current mobilised friction and dilation angle vs shear strain, loading and unloading data shown.
18. Manassero, 1989 – A plot of shear stress vs shear strain, loading and unloading data shown.
19. Manassero, 1989 – A plot of stress ratio vs shear strain, loading and unloading data shown.
20. Manassero, 1989 – A plot of shear stress vs normal stress, for both loading and unloading data. A line is plotted showing the peak angle of internal friction.

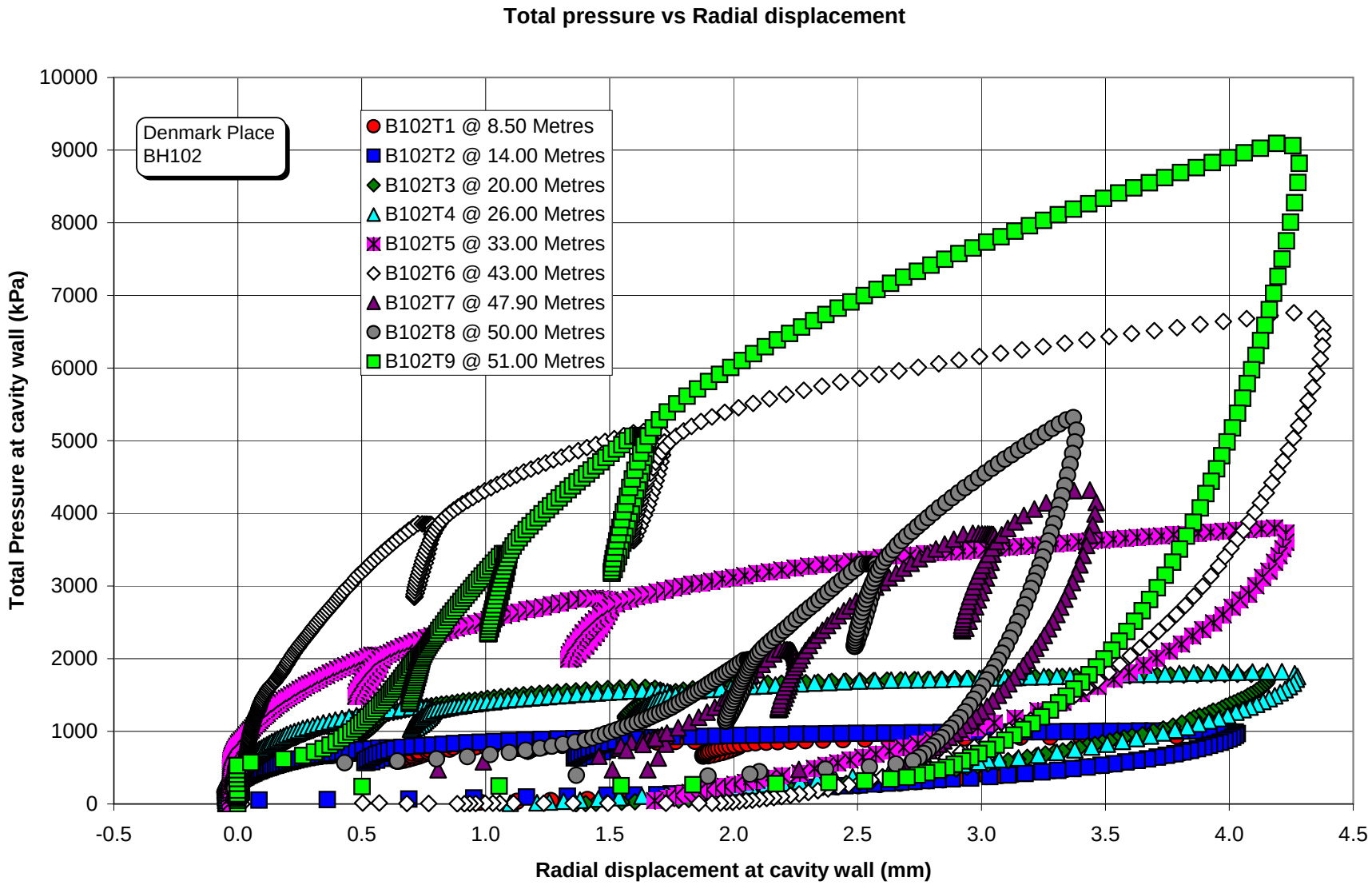
The following pages apply to all tests:

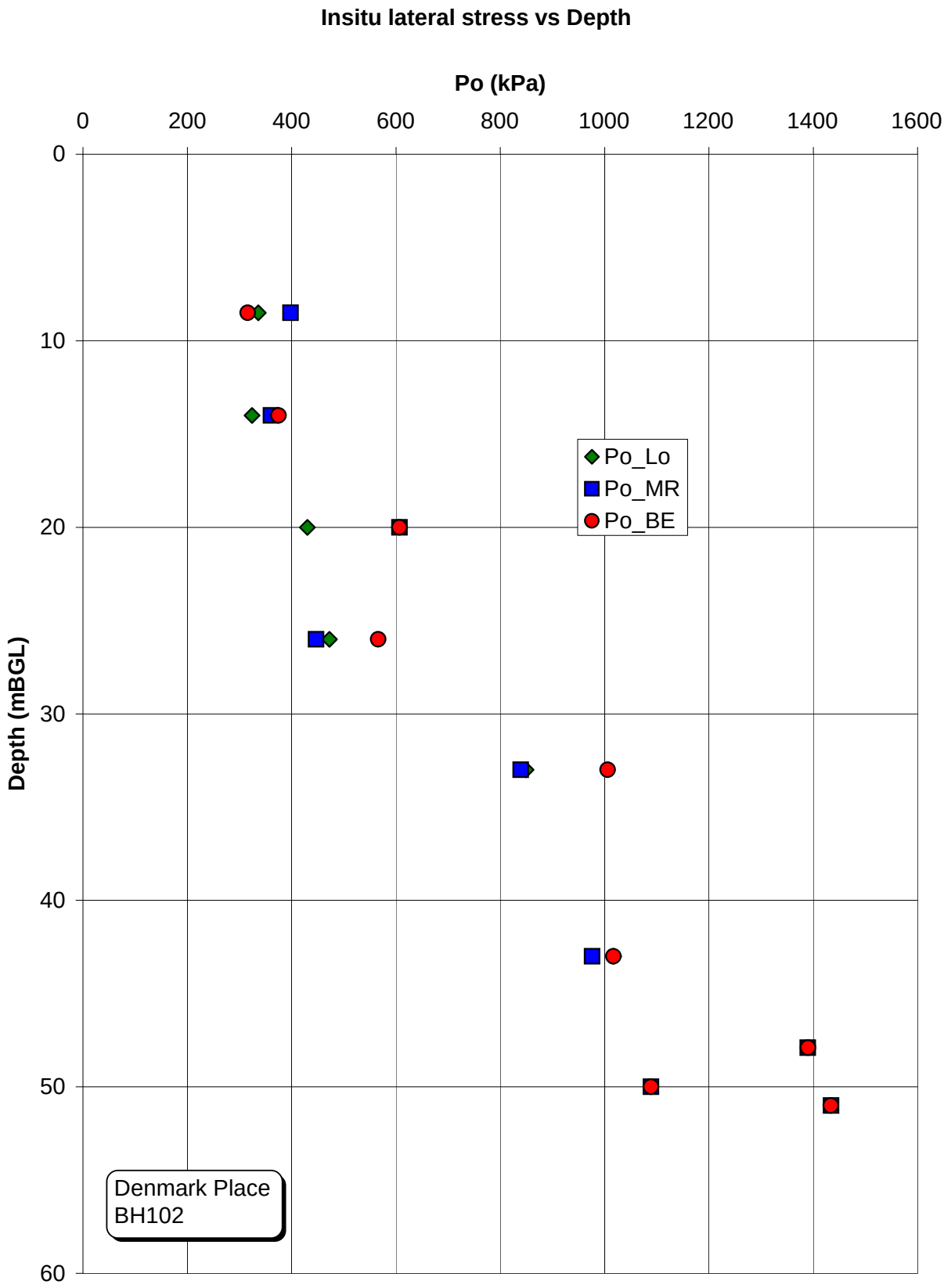
21. A handwritten test record sheet
22. From WINLOG - On axes of Radial Displacement/Total Pressure showing average displacement.
23. From WINLOG - On axes of Radial Displacement/Total Pressure showing all displacement sensors
24. From WINLOG - On axes of Radial Displacement/Total Pressure showing the three pairs of displacement sensors.
25. From WINLOG - On axes of Radial Displacement/Total Pressure showing two loading curves, the average of the odd numbered arms and the average of the even numbered arms.

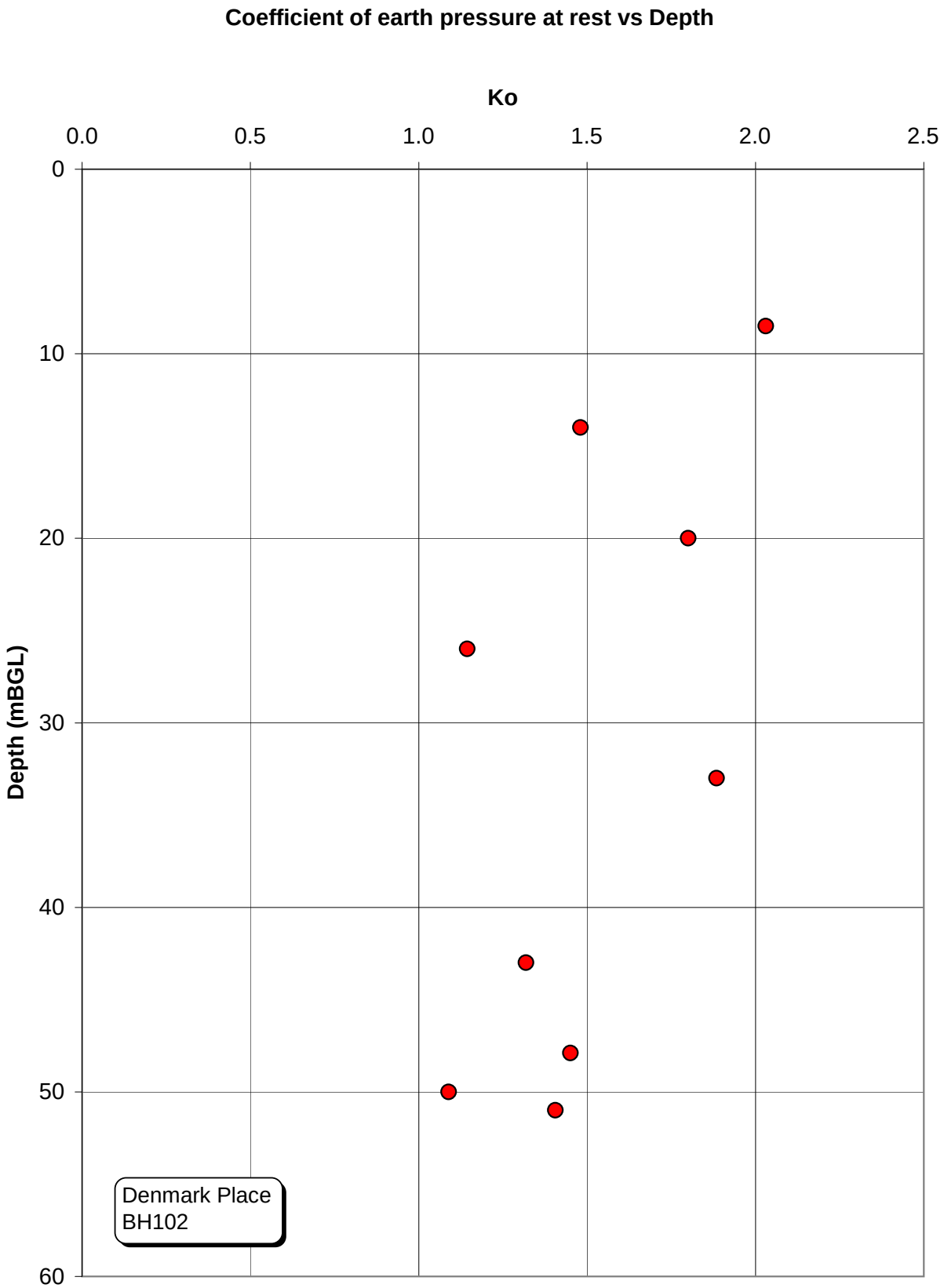
Because the information presented here comes from a variety of sources it is not possible to number the pages in a coherent manner, although within a test some pages may be numbered.

BOREHOLE BH102

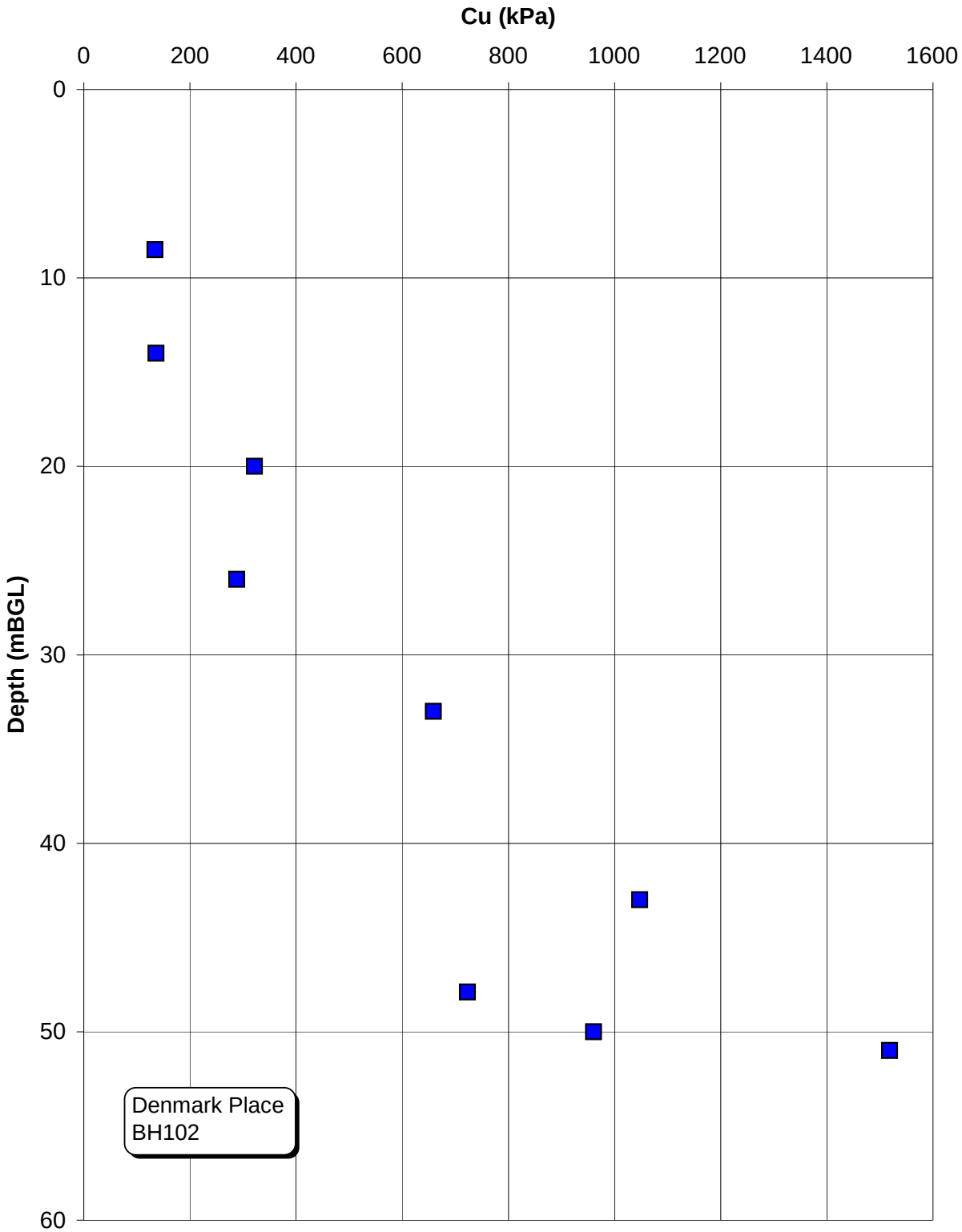
RESULTS SUMMARY PLOTS

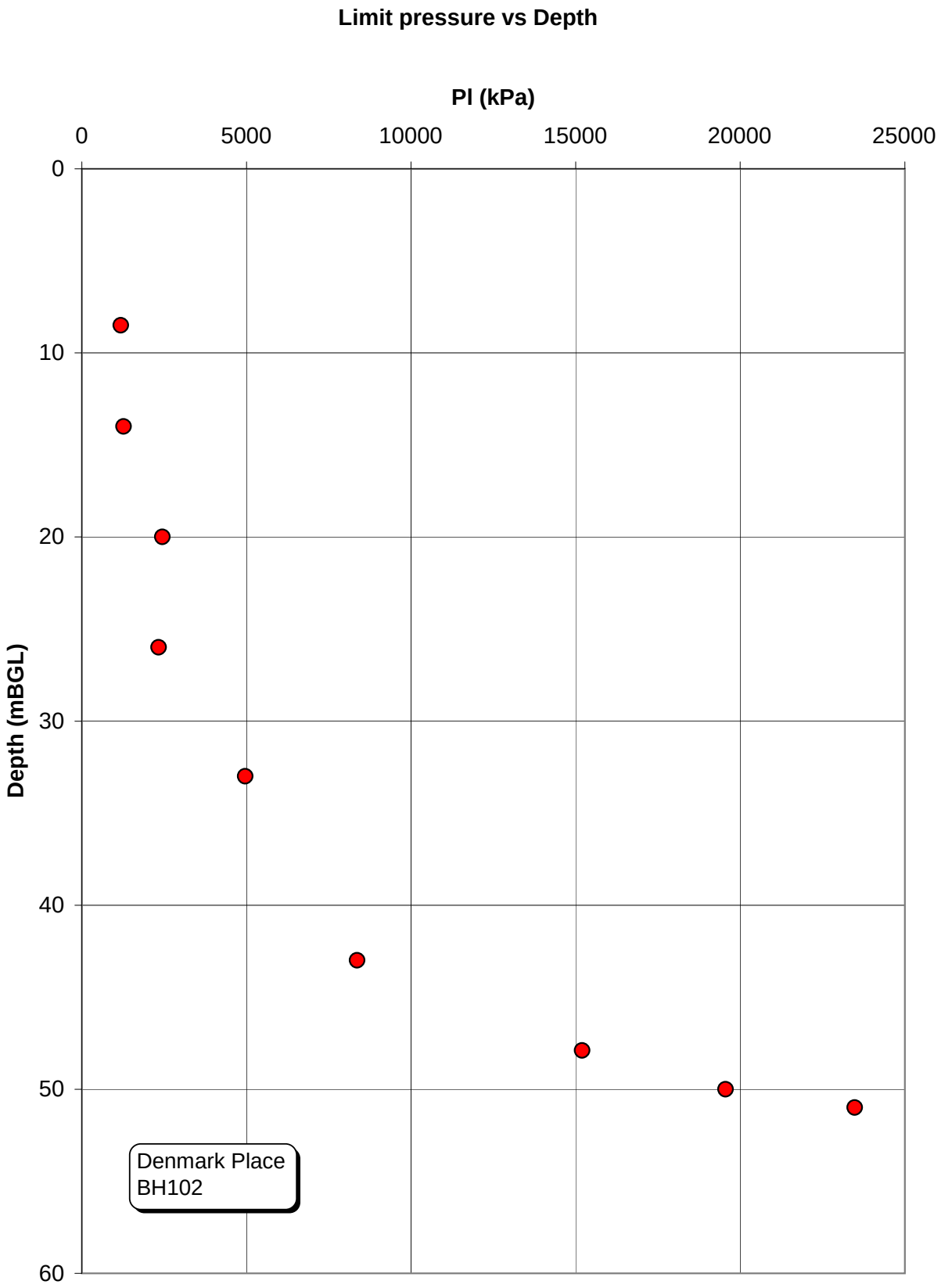

Total pressure vs Radial displacement
Denmark Place
BH102
B102T1 @ 8.50 Metres
B102T2 @ 14.00 Metres
B102T3 @ 20.00 Metres
B102T4 @ 26.00 Metres
B102T5 @ 33.00 Metres
B102T6 @ 43.00 Metres
B102T7 @ 47.90 Metres
B102T8 @ 50.00 Metres
B102T9 @ 51.00 Metres
Total Pressure at cavity wall (kPa)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
Radial displacement at cavity wall (mm)

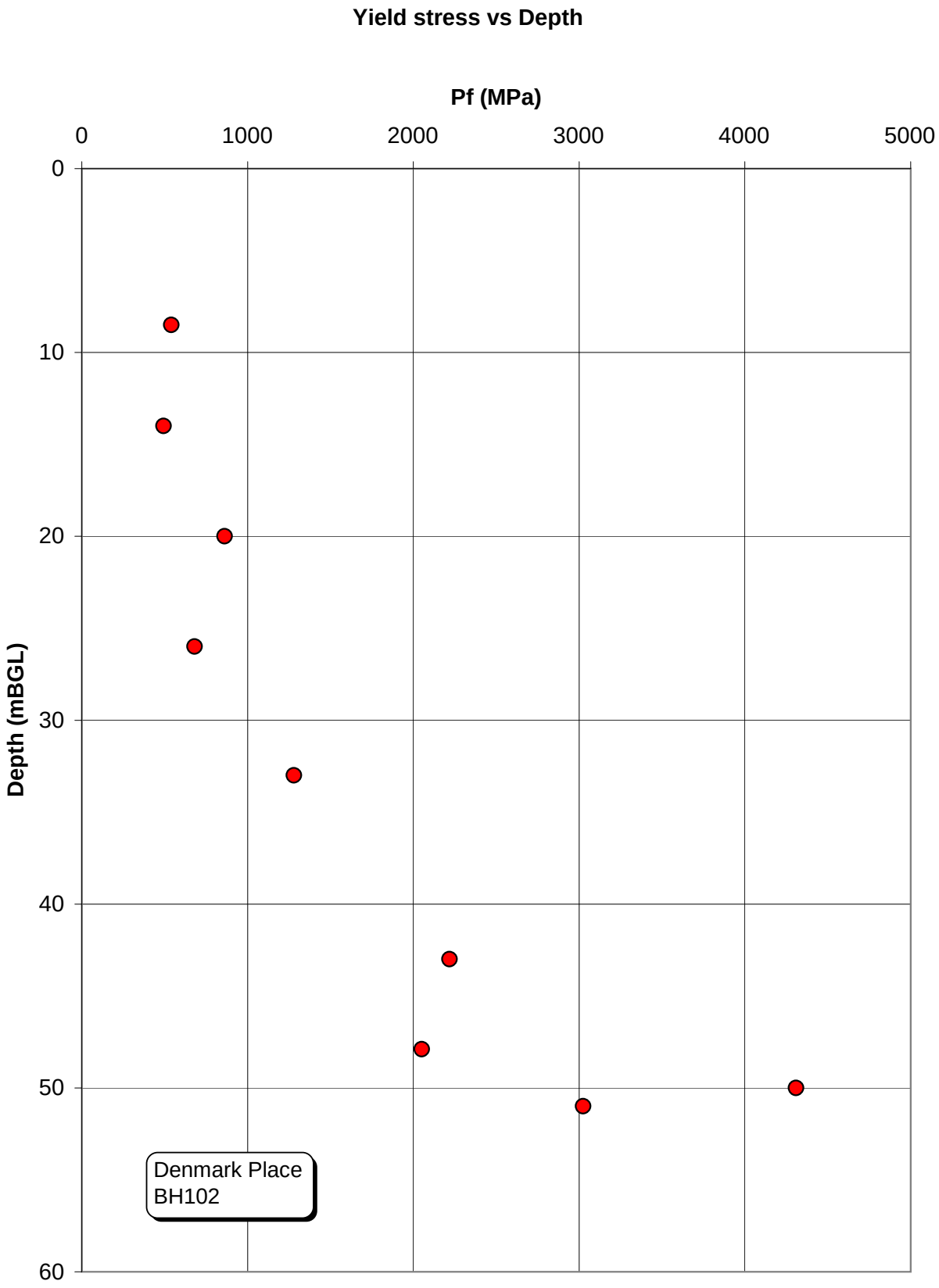

Insitu lateral stress vs Depth
Po (kPa)
0
200
400
600
800
1000
1200
1400
1600
Depth (mBGL)
0
10
20
30
40
50
60
Po_Lo
Po_MR
Po_BE
Denmark Place
BH102


Coefficient of earth pressure at rest vs Depth
Ko
0.0
0.5
1.0
1.5
2.0
2.5
0
10
20
30
40
50
60
Depth (mBGL)
Denmark Place
BH102

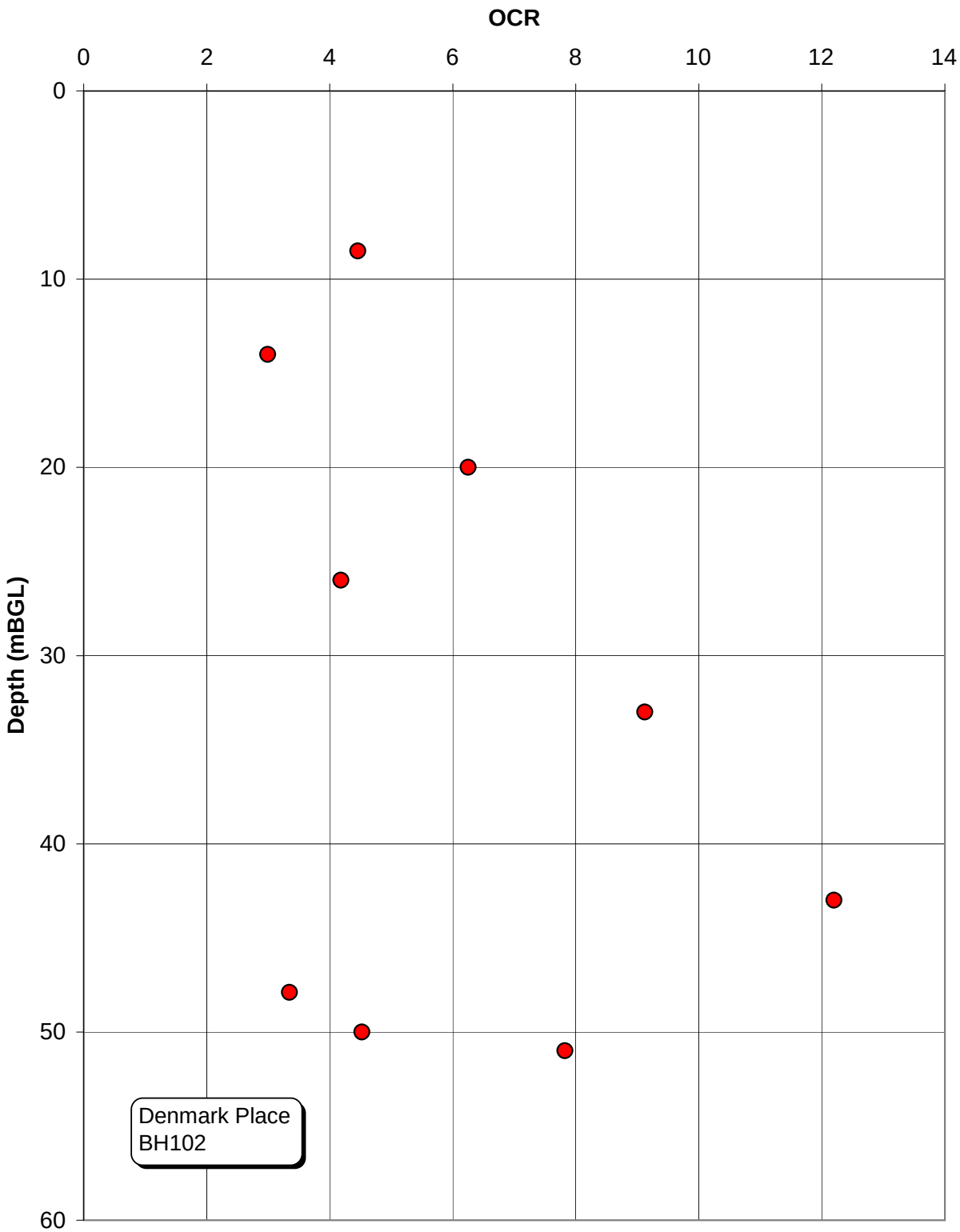
Undrained shear strength vs Depth



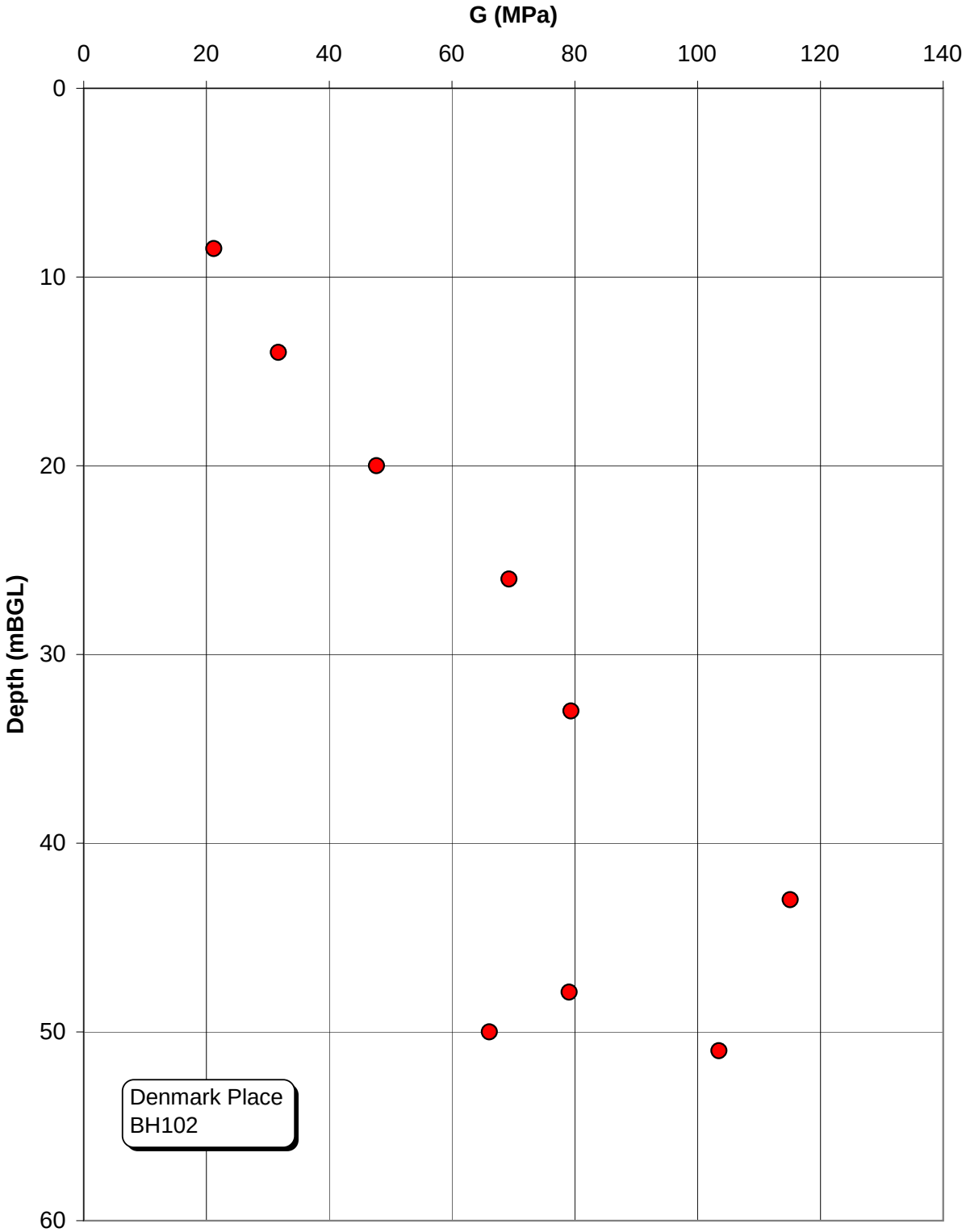

Limit pressure vs Depth
Pl (kPa)
0
5000
10000
15000
20000
25000
Depth (mBGL)
0
10
20
30
40
50
60
Denmark Place
BH102

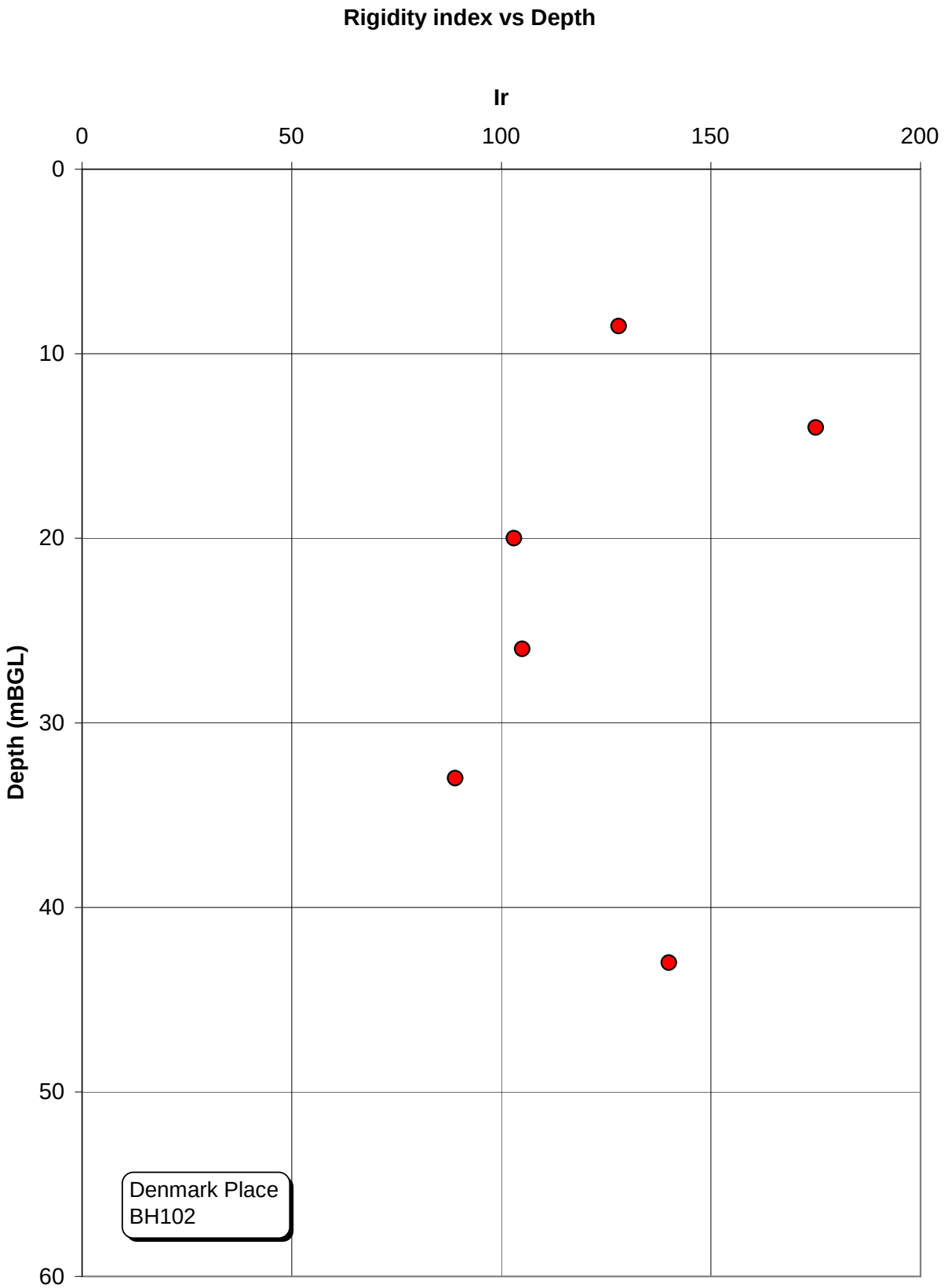

Yield stress vs Depth
Pf (MPa)
0
1000
2000
3000
4000
5000
Depth (mBGL)
0
10
20
30
40
50
60
Denmark Place
BH102

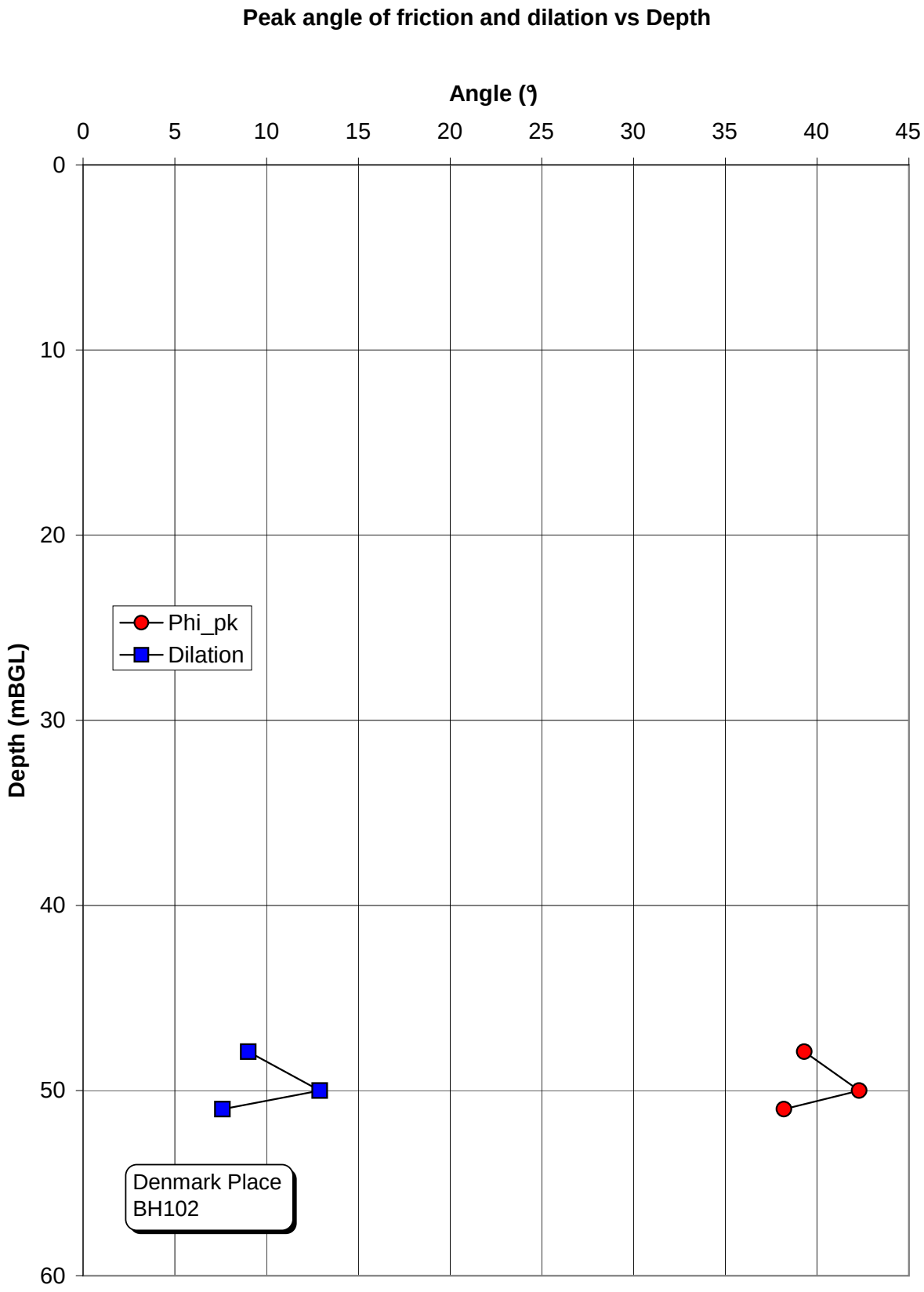
Over consolidation ratio vs Depth



Initial shear modulus vs Depth



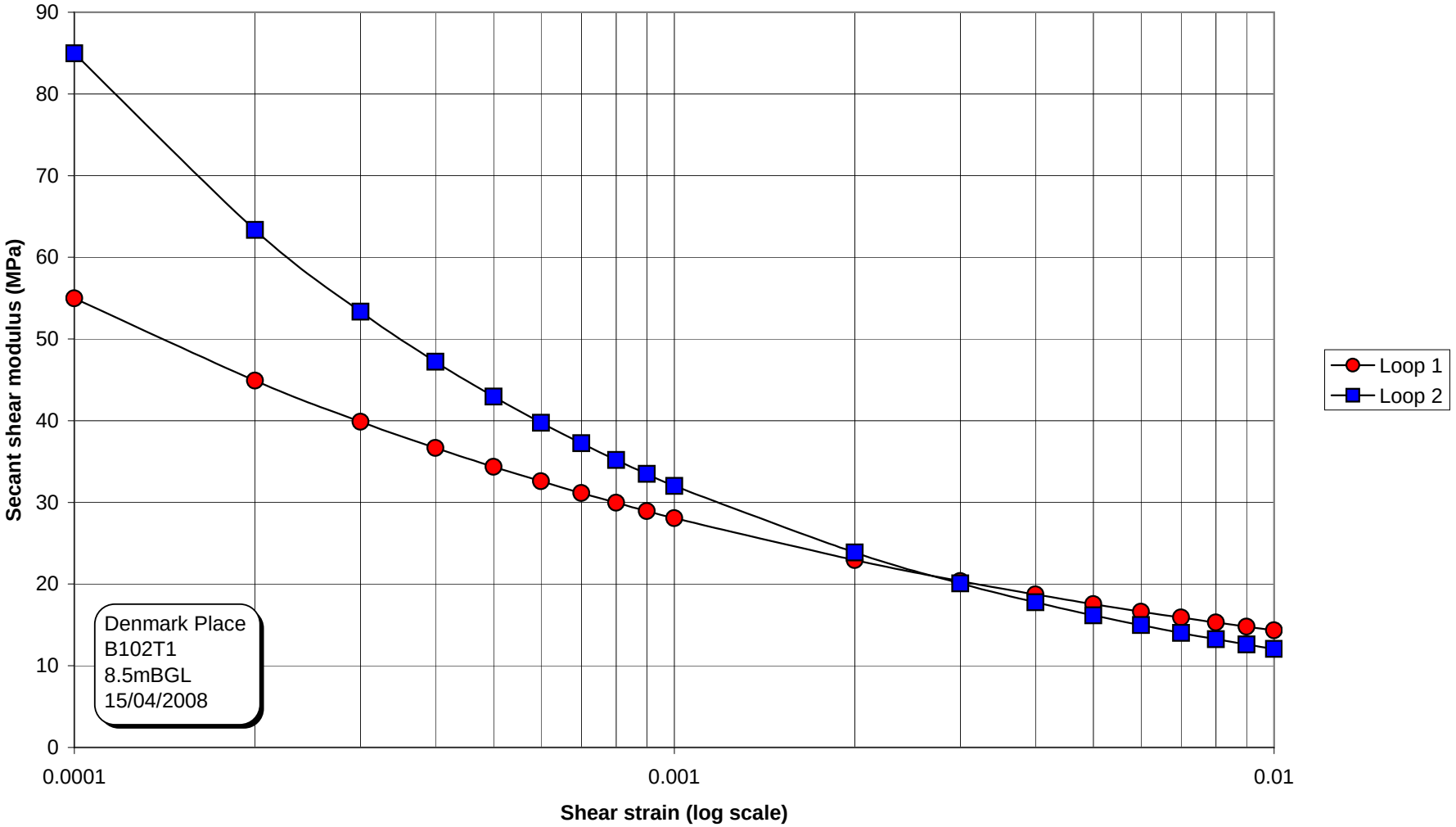

Rigidity index vs Depth
Ir
0
50
100
150
200
Depth (mBGL)
0
10
20
30
40
50
60
Denmark Place
BH102


Peak angle of friction and dilation vs Depth
Angle (°)
0
5
10
15
20
25
30
35
40
45
Depth (mBGL)
0
10
20
30
40
50
60
Phi_pk
Dilation
Denmark Place
BH102

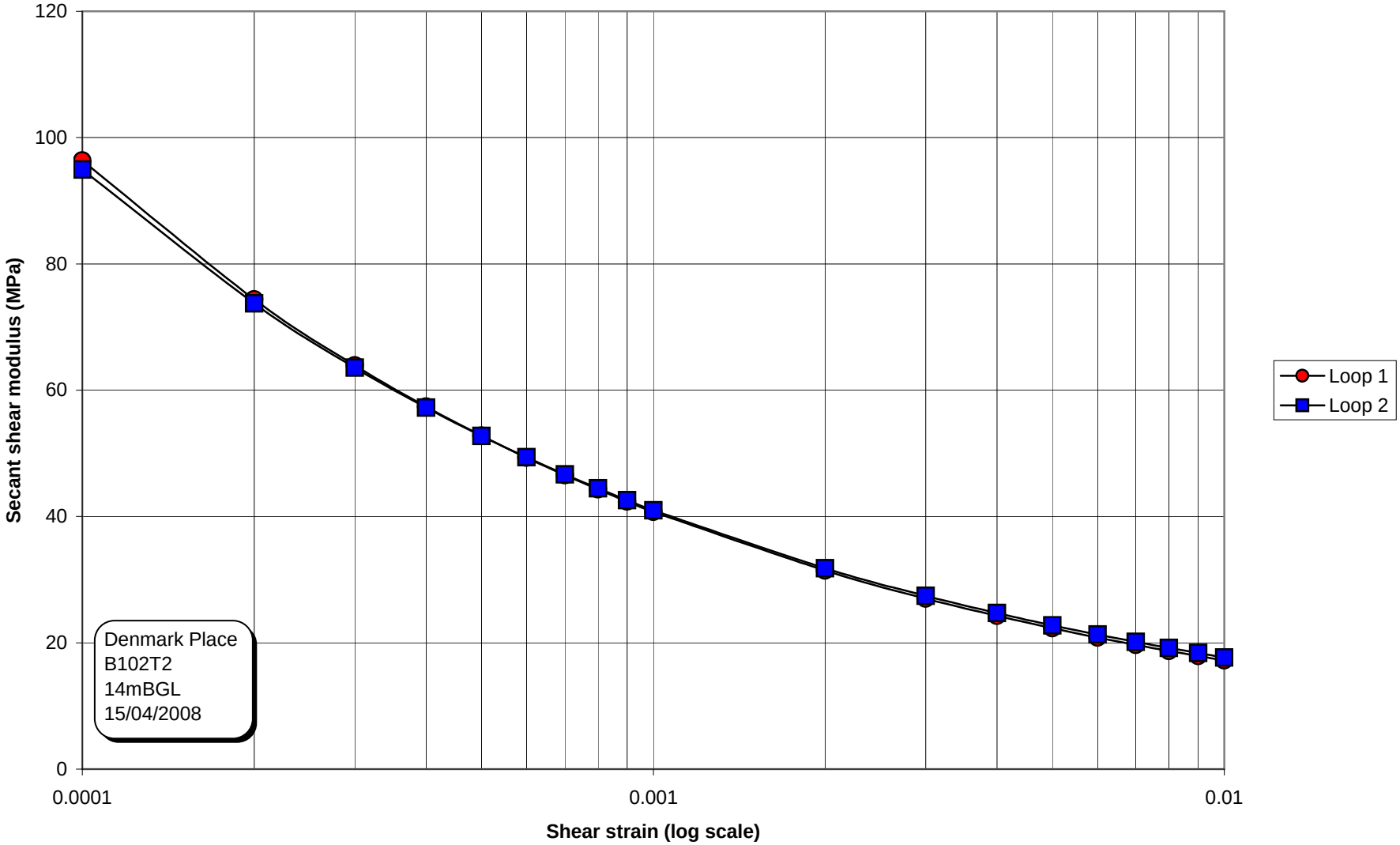
BOREHOLE B102

SHEAR MODULUS DATA FROM THE ANALYSIS OF UNLOAD/RELOAD CYCLES

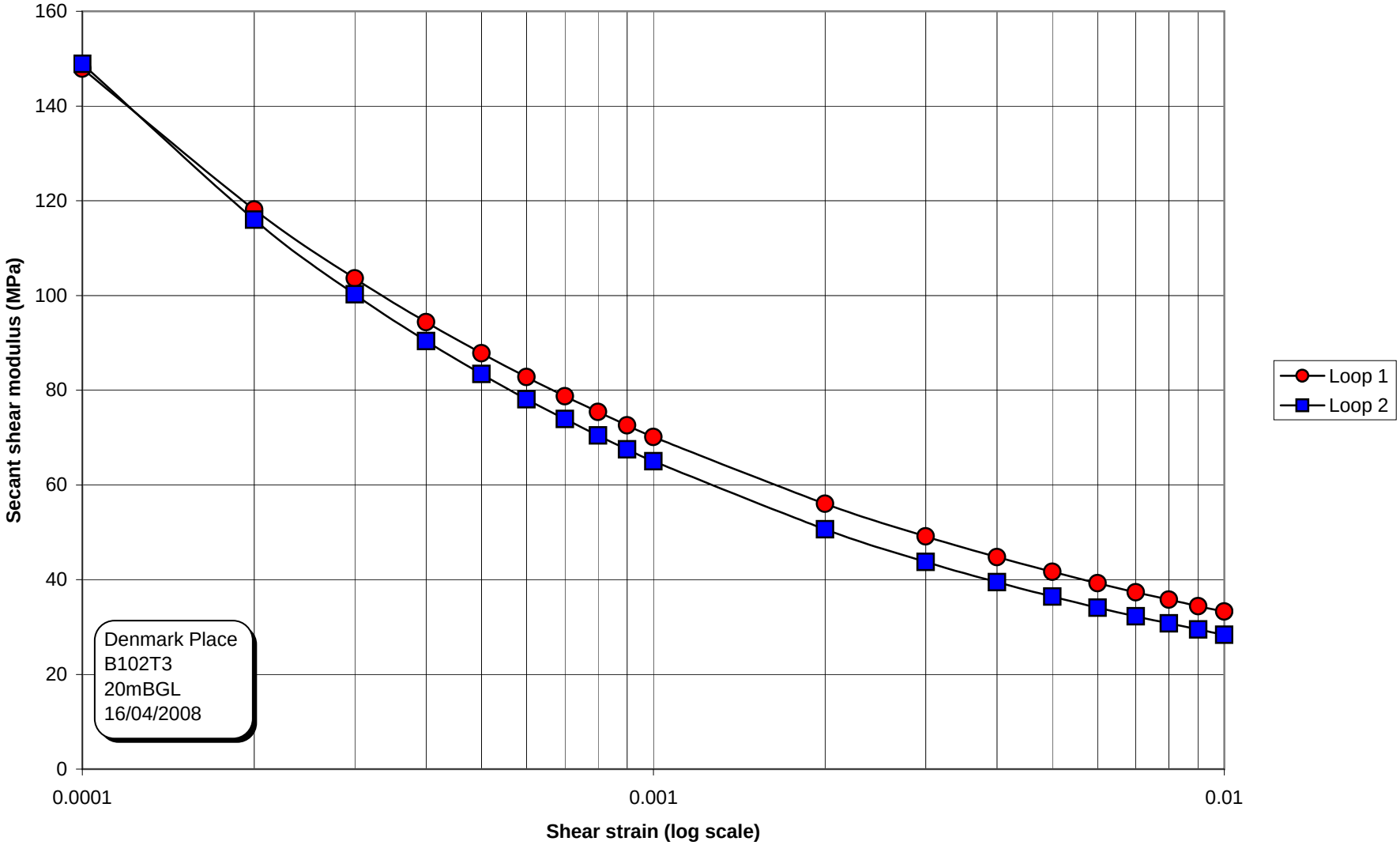
The variation of secant shear modulus with shear strain



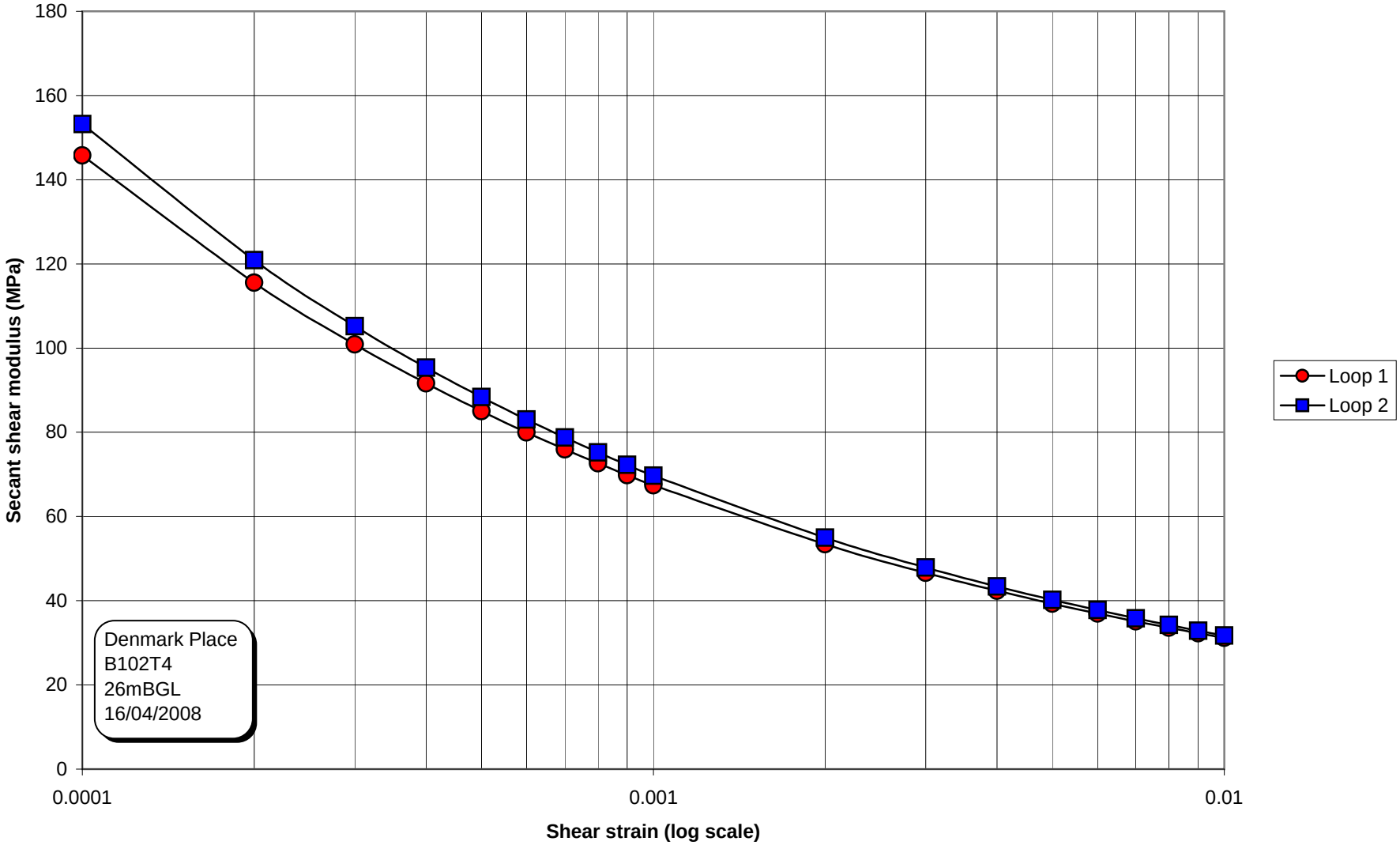
The variation of secant shear modulus with shear strain



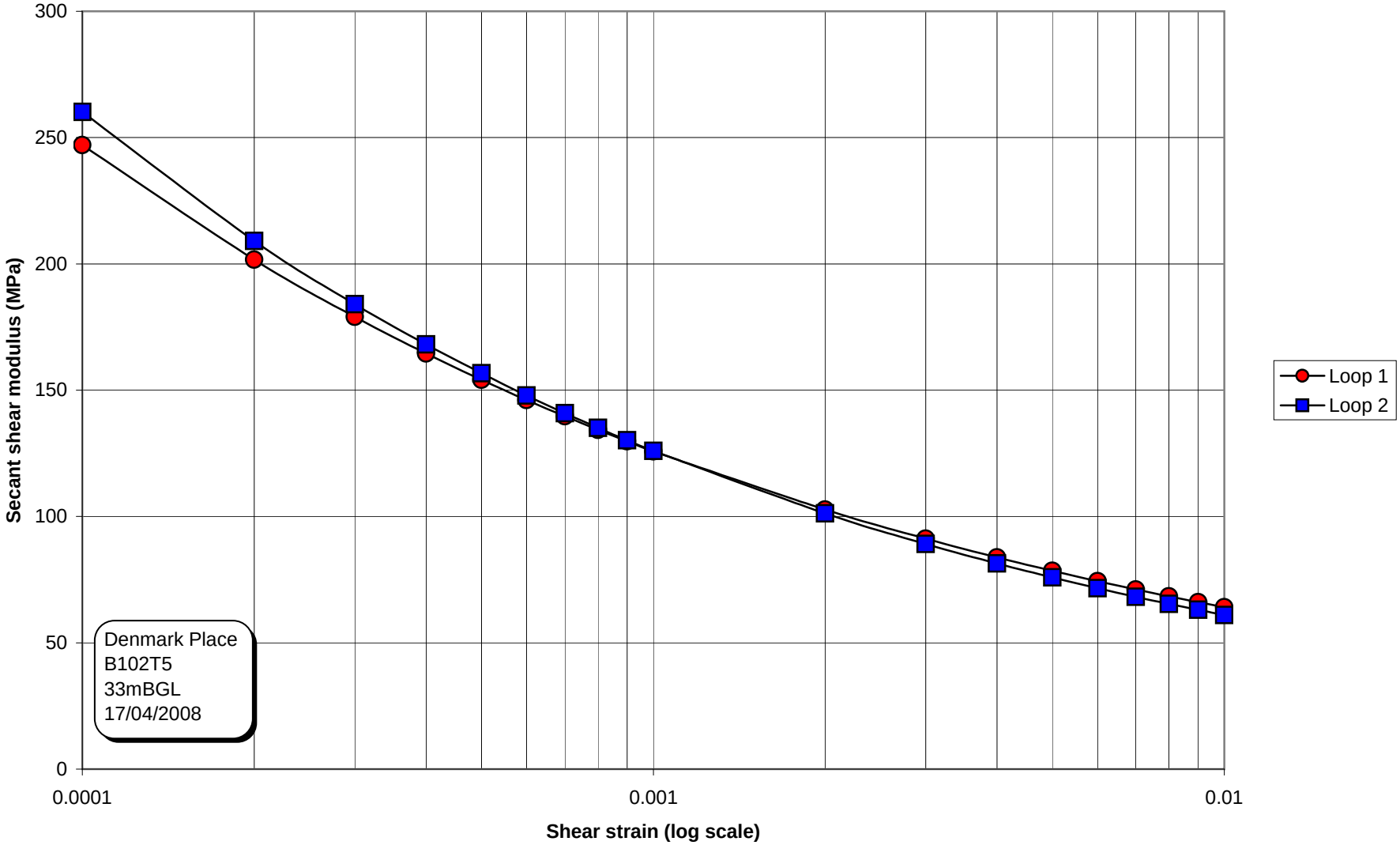
The variation of secant shear modulus with shear strain



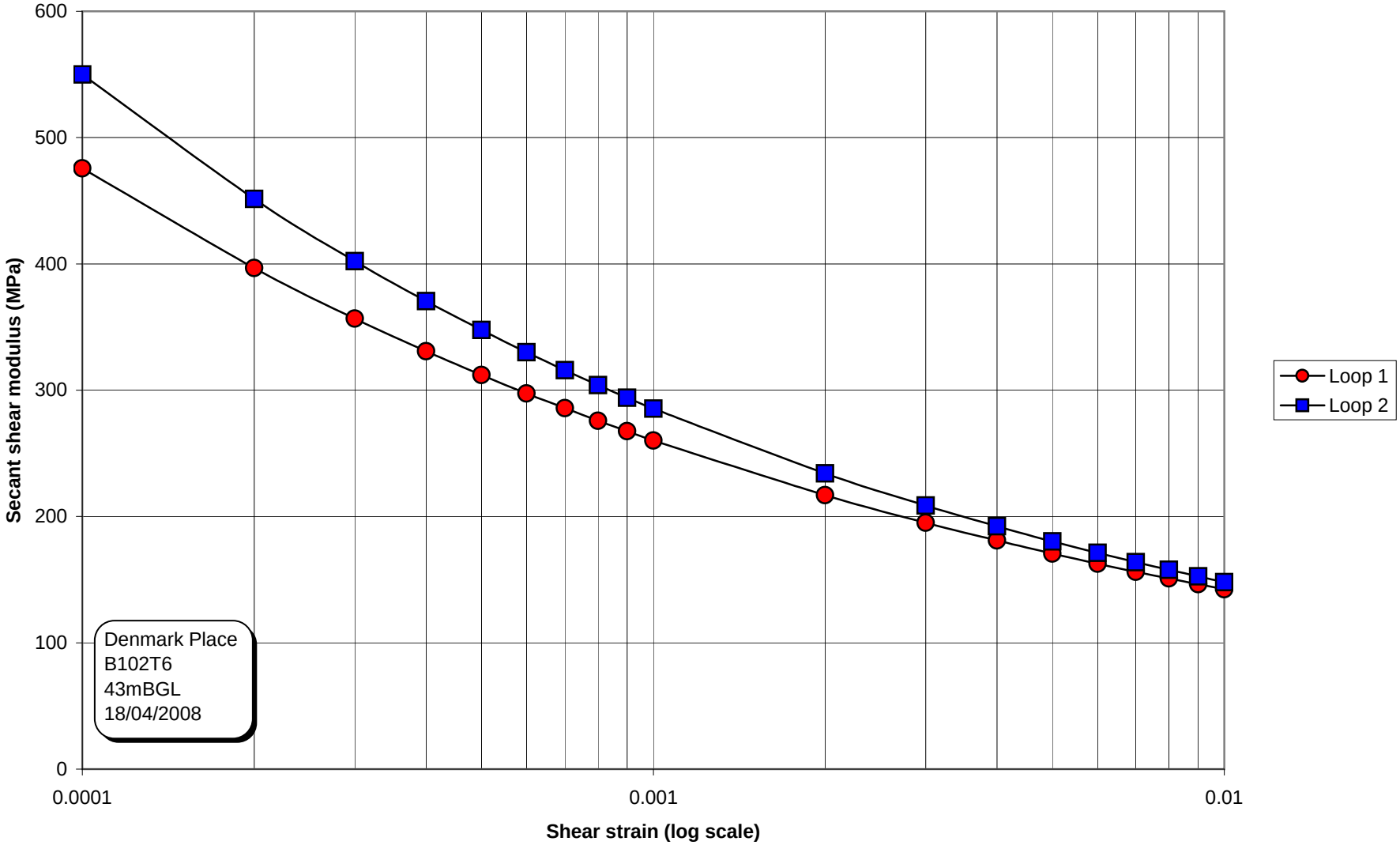
The variation of secant shear modulus with shear strain



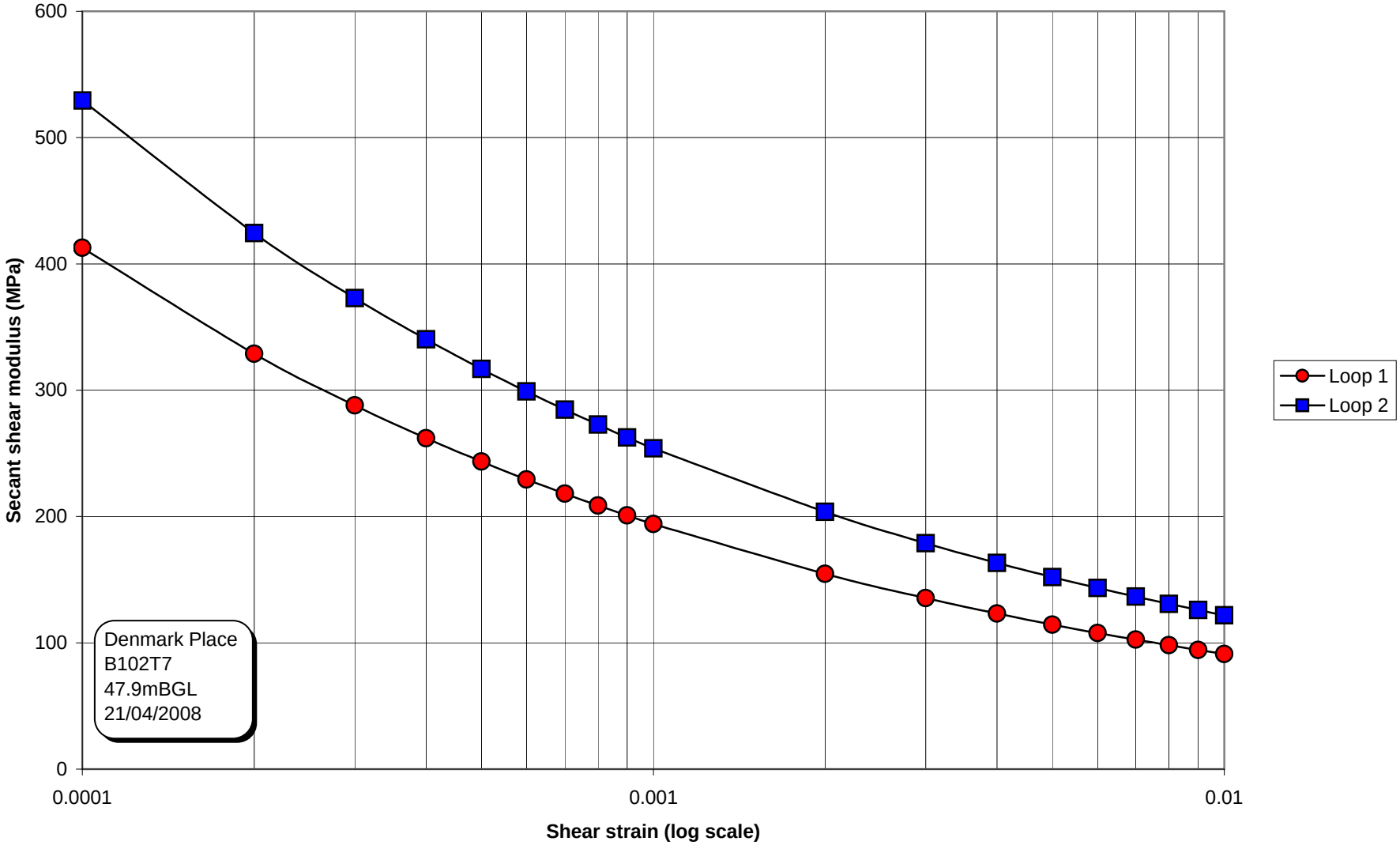
The variation of secant shear modulus with shear strain



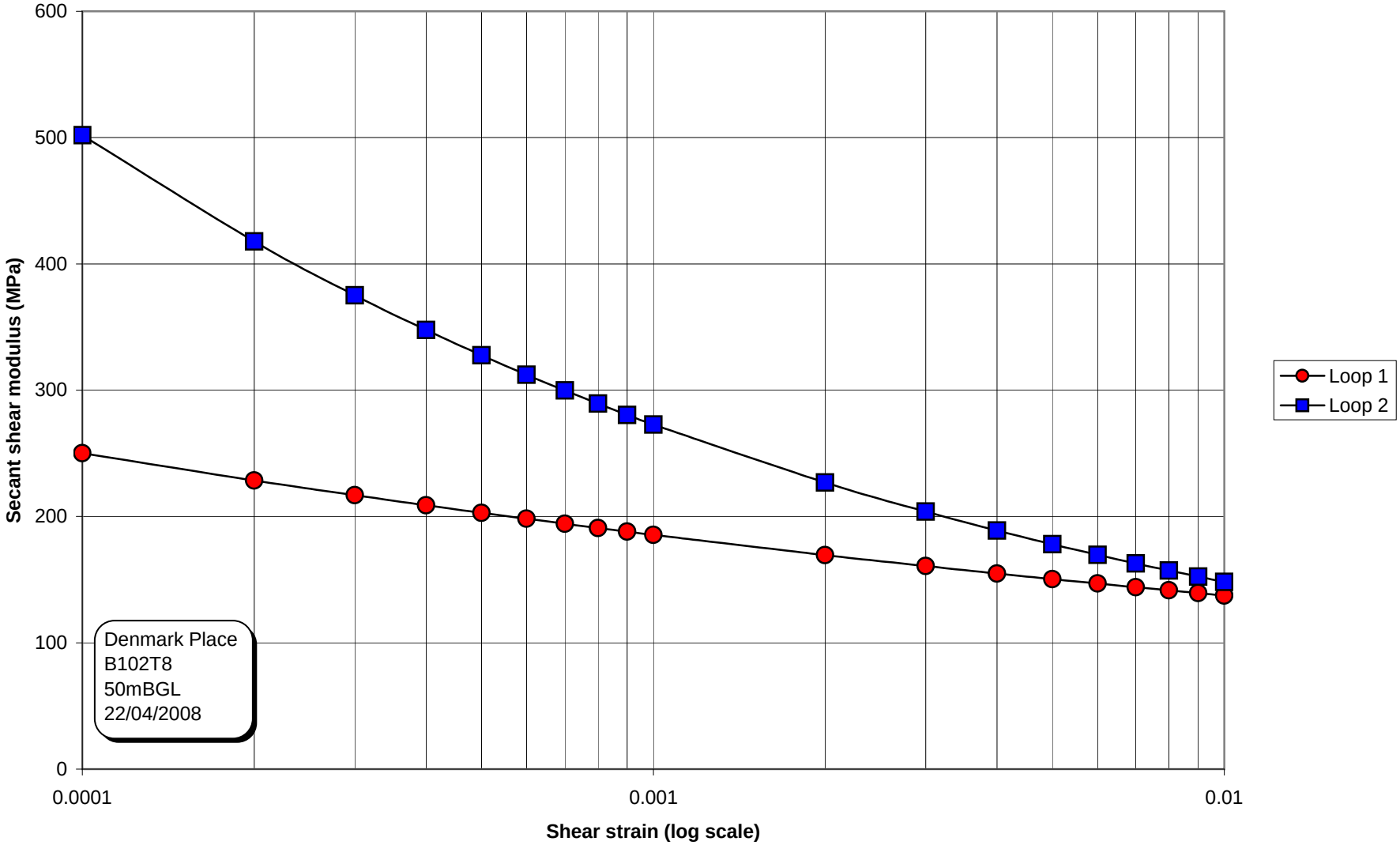
The variation of secant shear modulus with shear strain



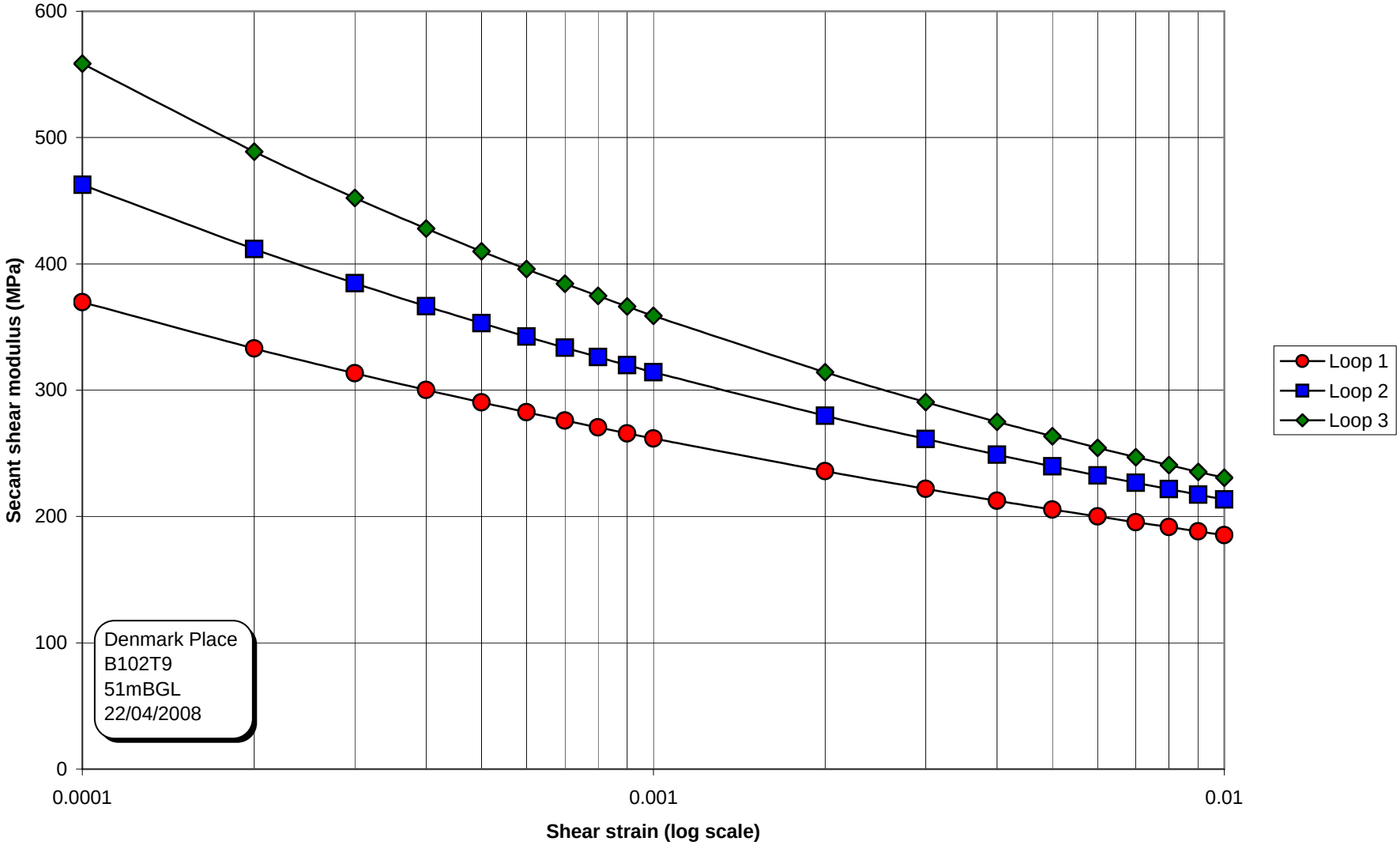
The variation of secant shear modulus with shear strain



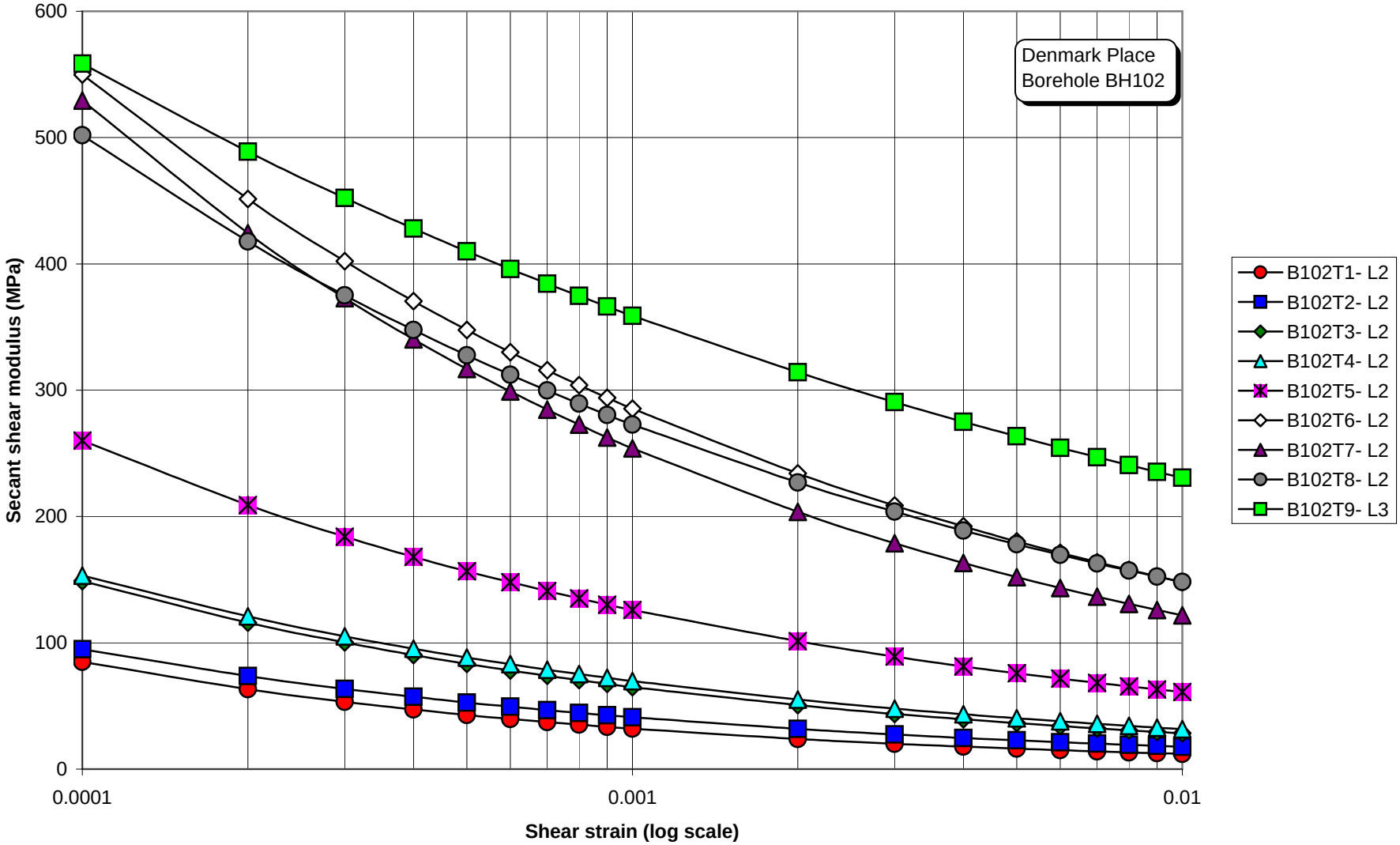
The variation of secant shear modulus with shear strain



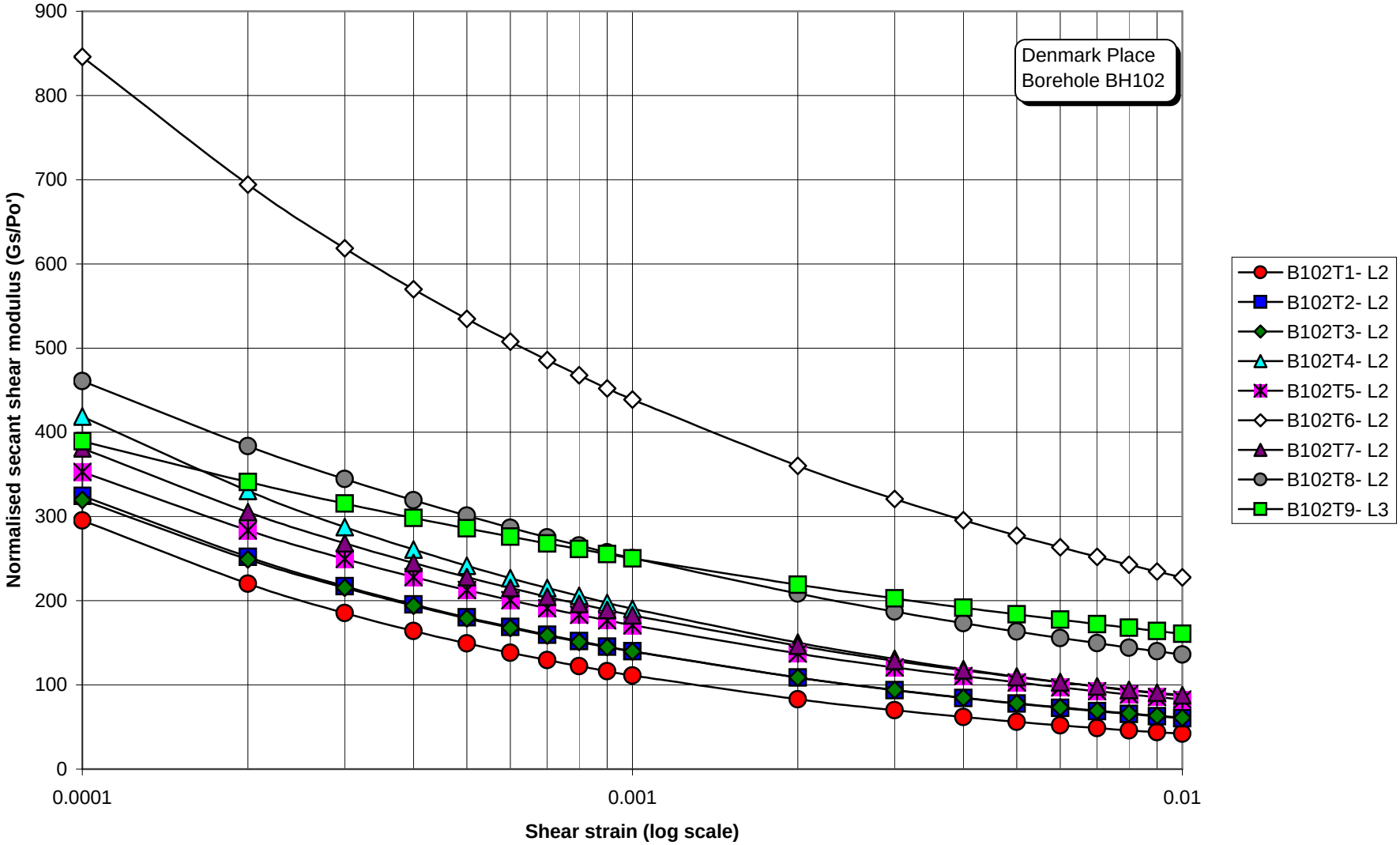
The variation of secant shear modulus with shear strain



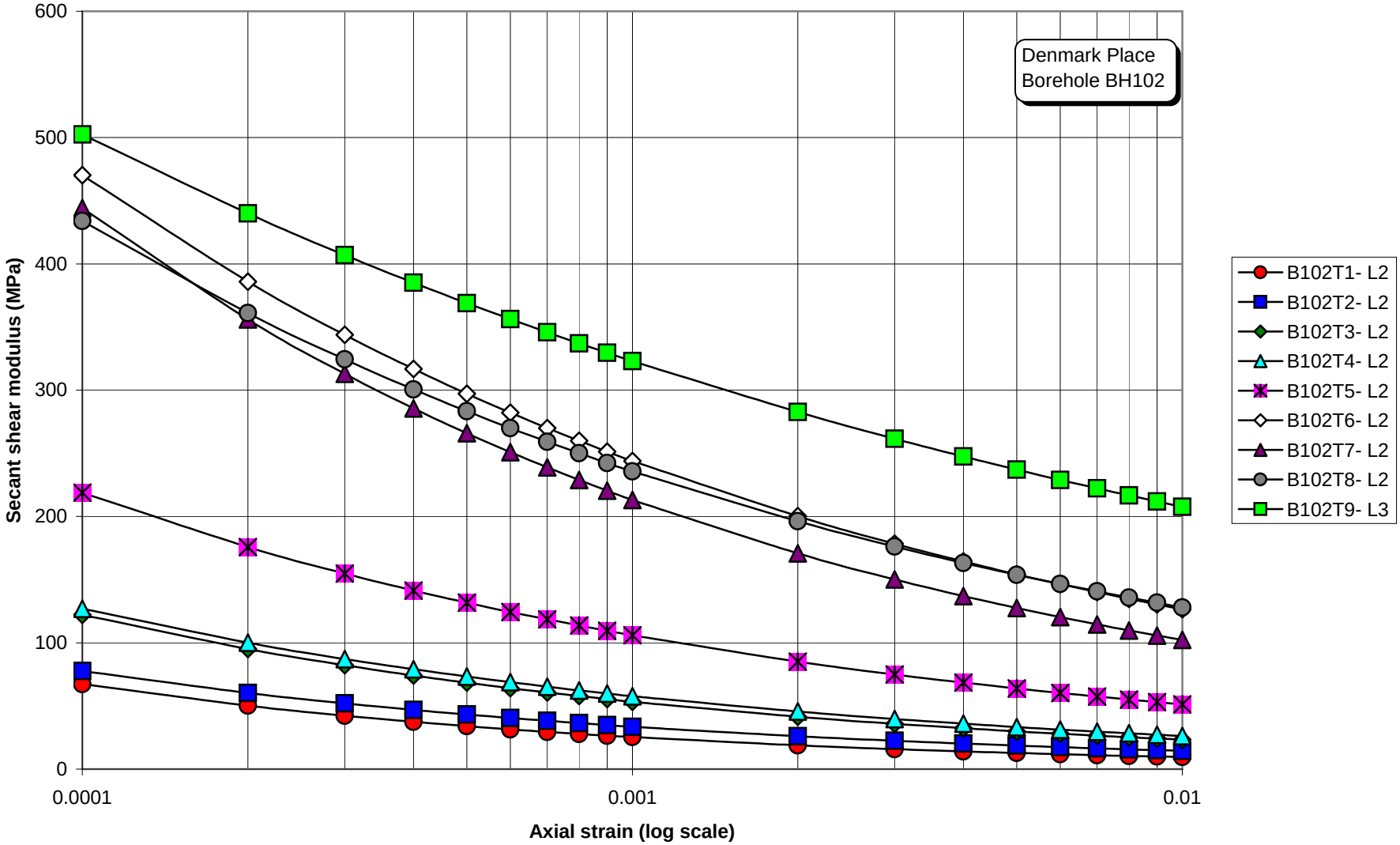
Secant shear modulus versus shear strain, all tests



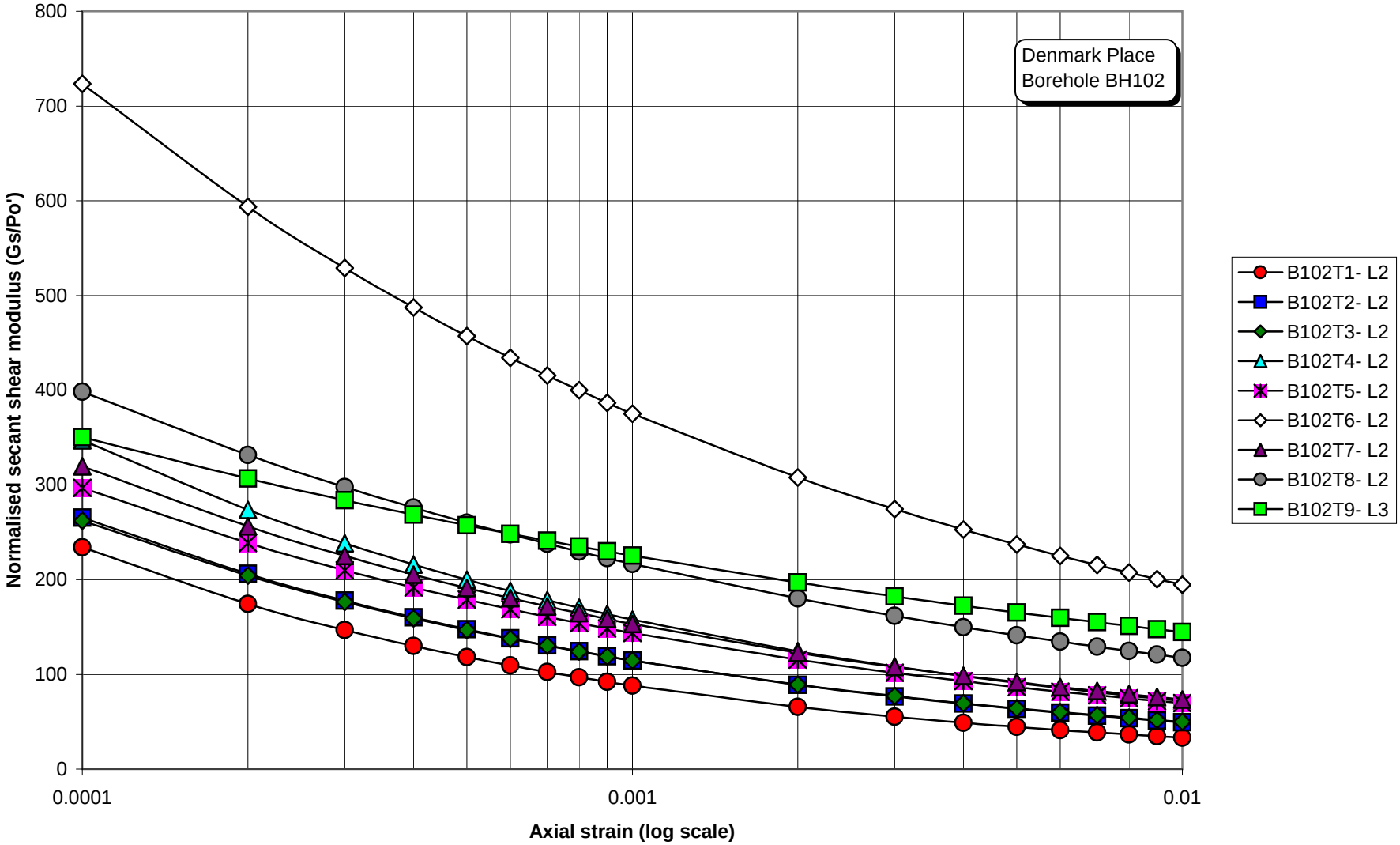
Normalised secant shear modulus versus shear strain, all tests



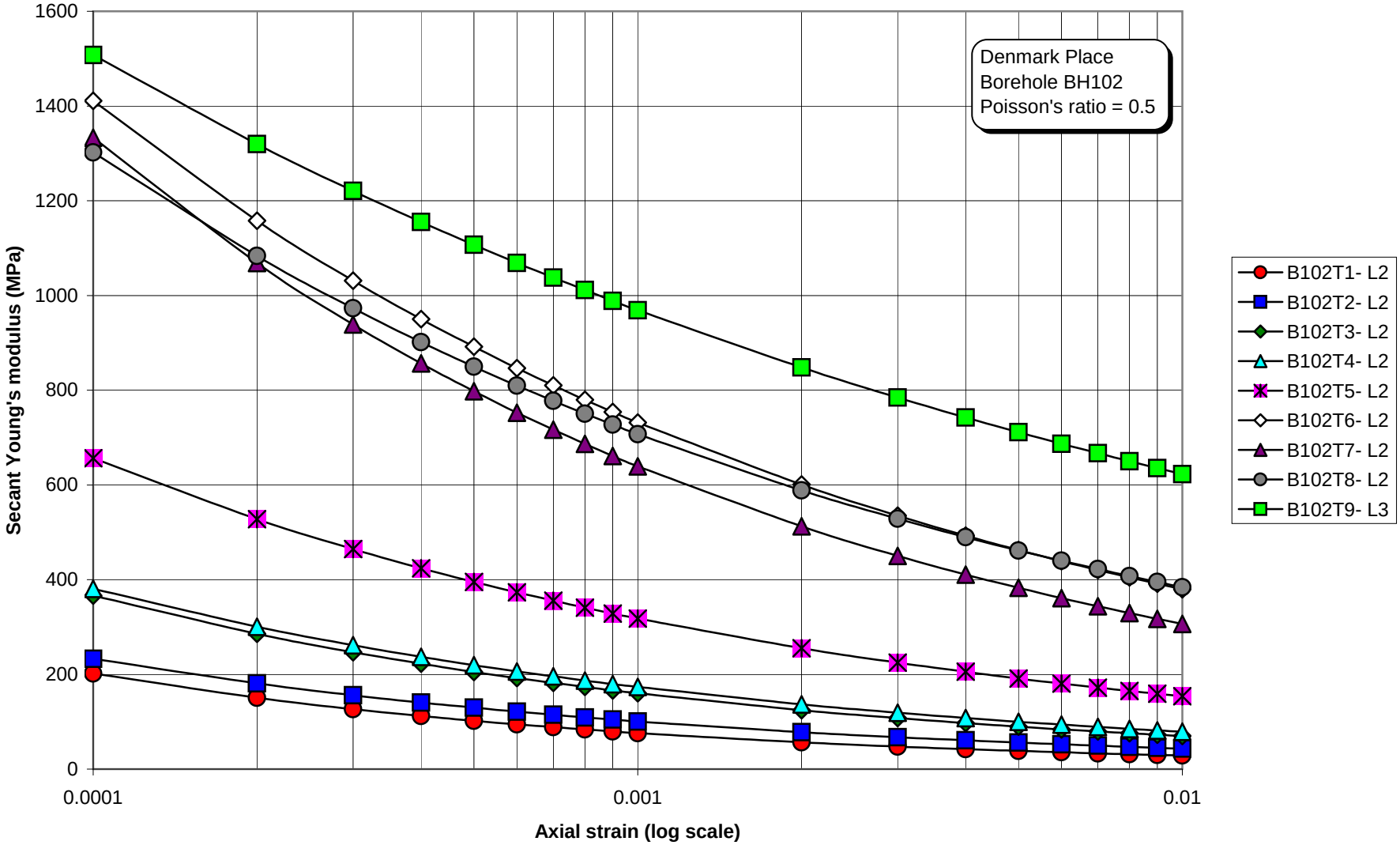
Secant shear modulus versus axial strain, all tests



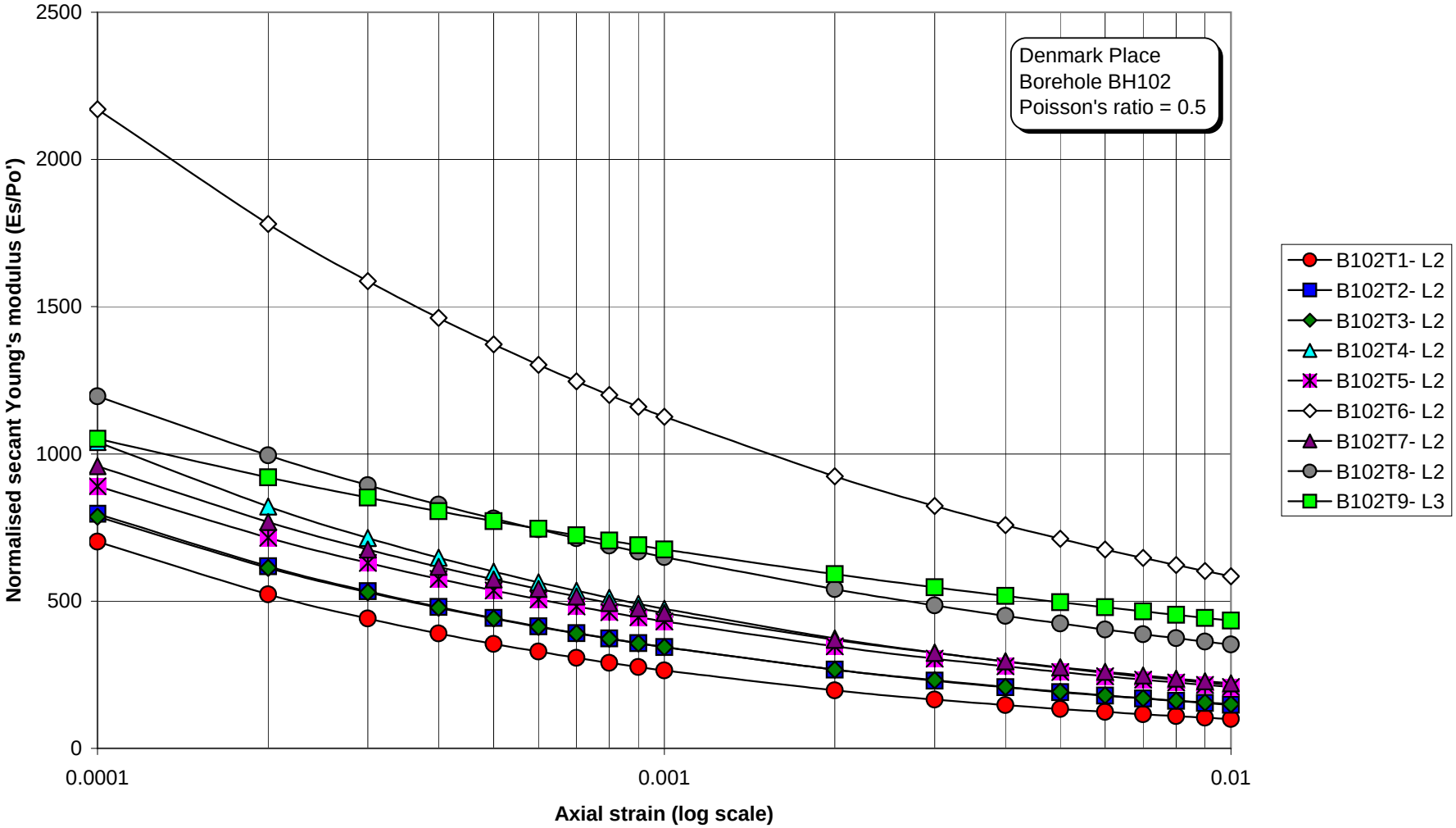
Normalised secant shear modulus versus axial strain, all tests



Secant Young's modulus versus axial strain, all tests



Normalised secant Young's modulus versus axial strain, all tests



BOREHOLE B102

TEST DATA FOR INDIVIDUAL TESTS

(TAKEN FROM WINSITU, EXCEL AND WINLOG FILES)

B102T1 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]
Project : 36237
Site : Denmark Place
Borehole : BH102
Test name : B102T1
Test date : 15 Apr 08
Test depth : 8.50 Metres
Water table : 5.6 Metres
Ambient PWP : 28.4 kPa
Material : London Clay
Probe : Digital 6 arm weak rock self boring pressuremeter
Diameter : 88.1 mm
Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out
The file includes results from a curve fitting analysis

Analysed by RWW on 15 Apr 08

Remarks: Problems with power supply - affected SCU so first loop spoiled.

[RESULTS FOR CAVITY REFERENCE PRESSURE]
Strain Origin (mm) : "Arm ave=-0.050"
Po from Marsland & Randolph (kPa) : "Arm ave=398.0"
Po from Lift off (kPa) : "Arm ave=336.3"
PWP versus Total Stress (kPa) : "PPC Ave=202.0"
Best estimate of Po (kPa) : "Arm ave=316.0"

[UNDRAINED STRENGTH PARAMETERS]
Gibson & Anderson 1961 - Cu (kPa) : "Arm ave=132.1"
Limit pressure (kPa) : "Arm ave=1187"
Jefferies 1988 - Cu (kPa) : "Arm ave=134.4"
Undrained yield stress (kPa) : "Arm ave=541.0"

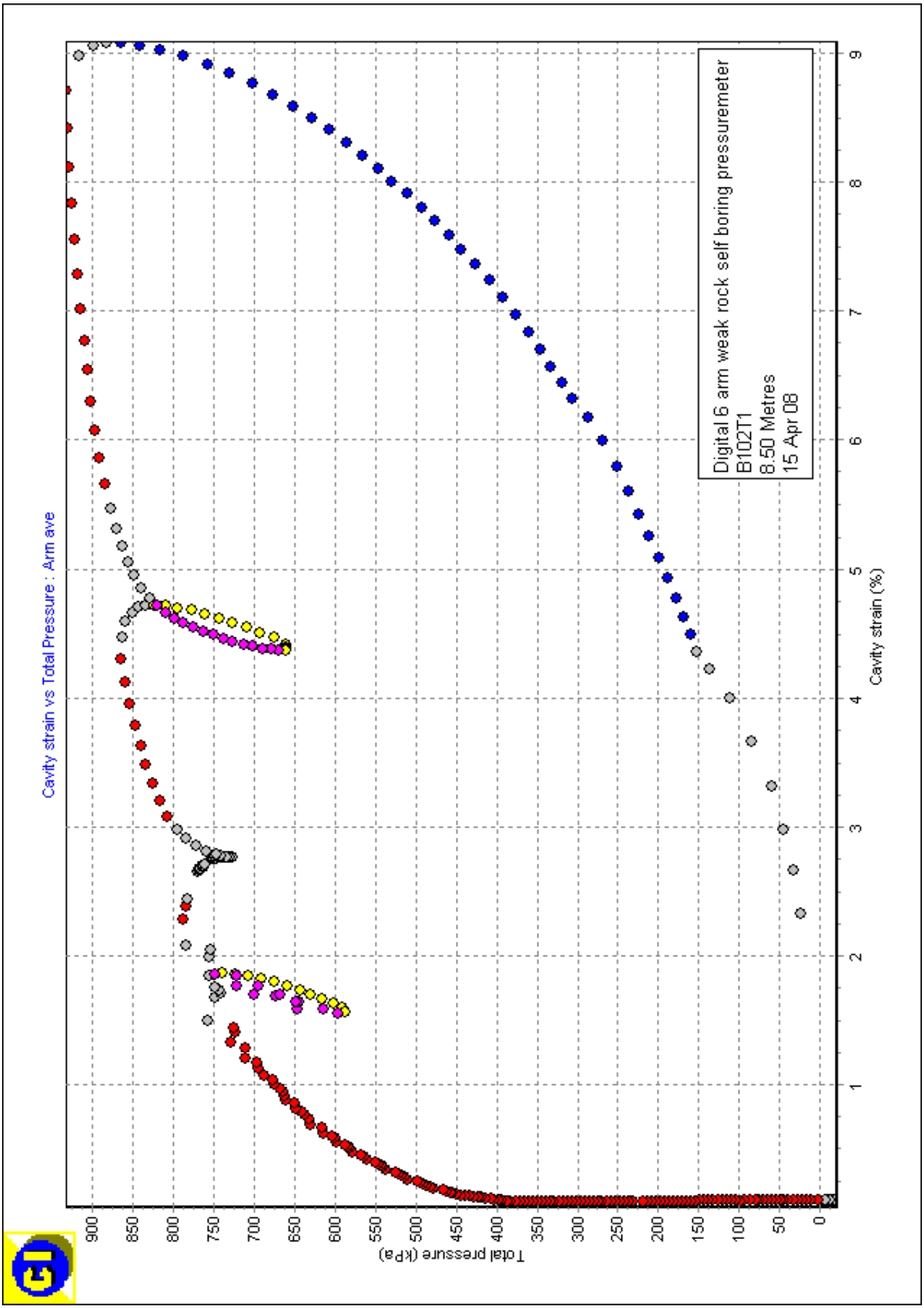
[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=21.2"

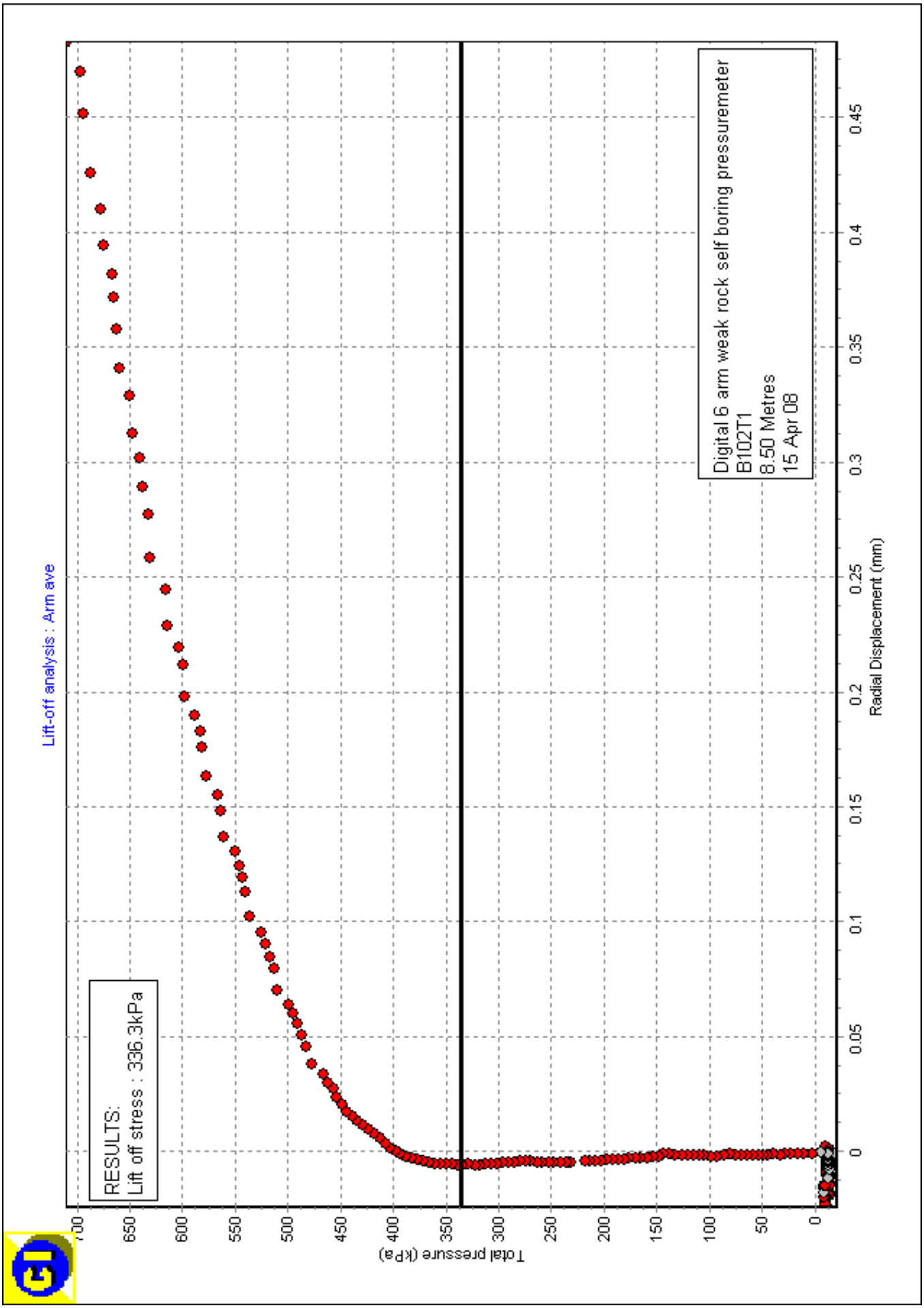
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	25.0	1.723	661	0.591	148
Arm ave	2	24.2	4.554	740	0.675	164

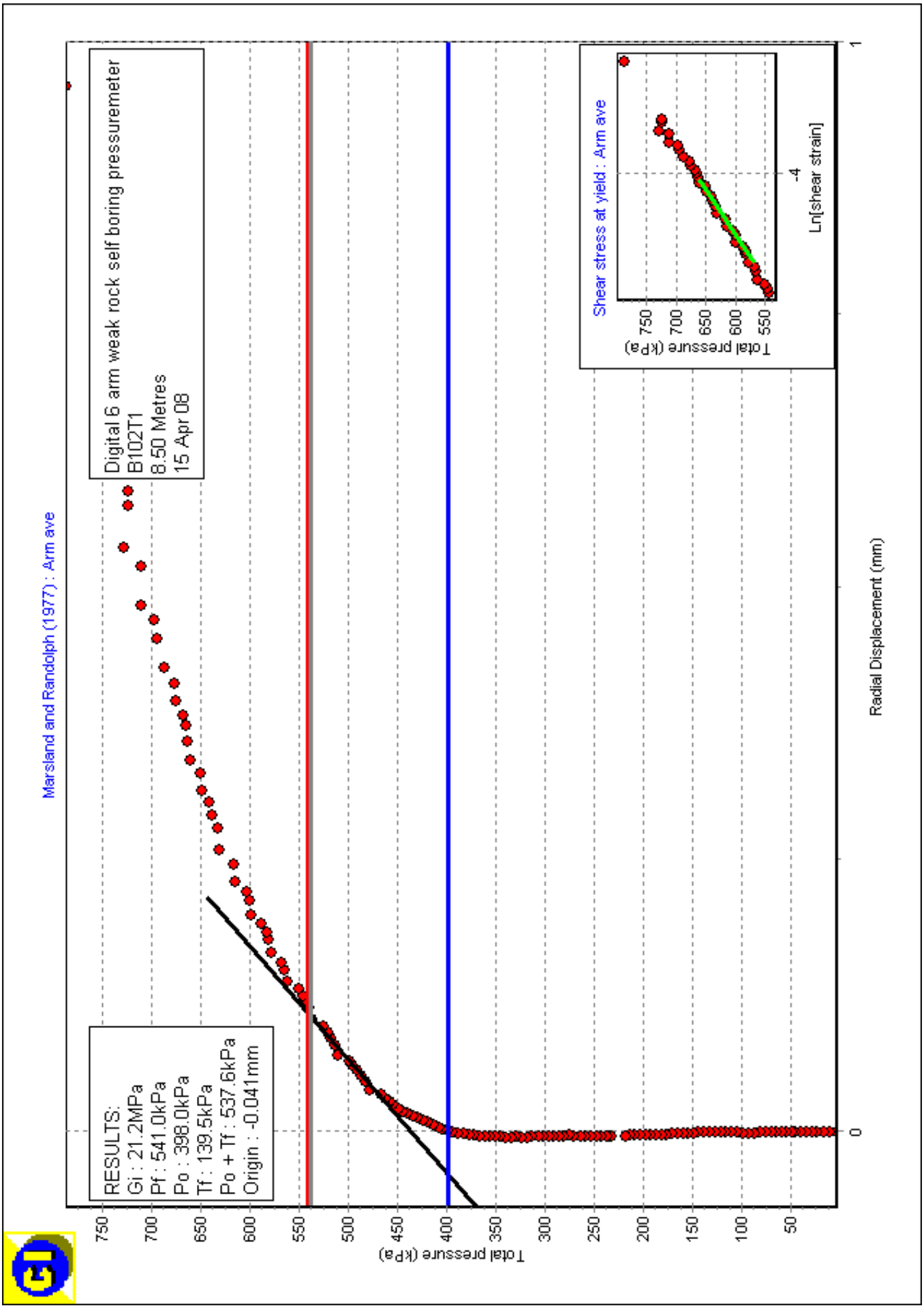
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

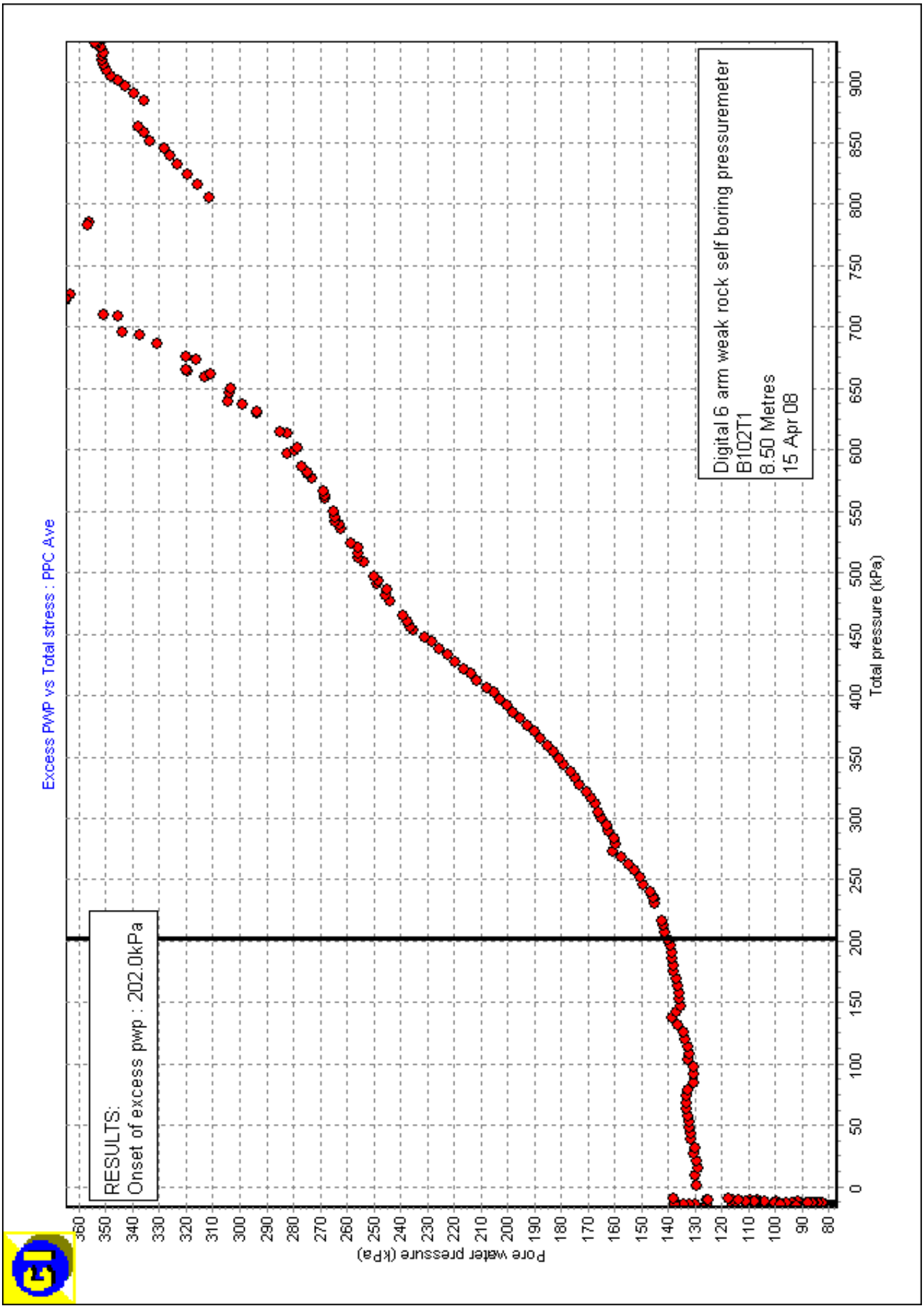
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	5.269	3.733	0.708
Arm ave	2	2.972	1.711	0.576

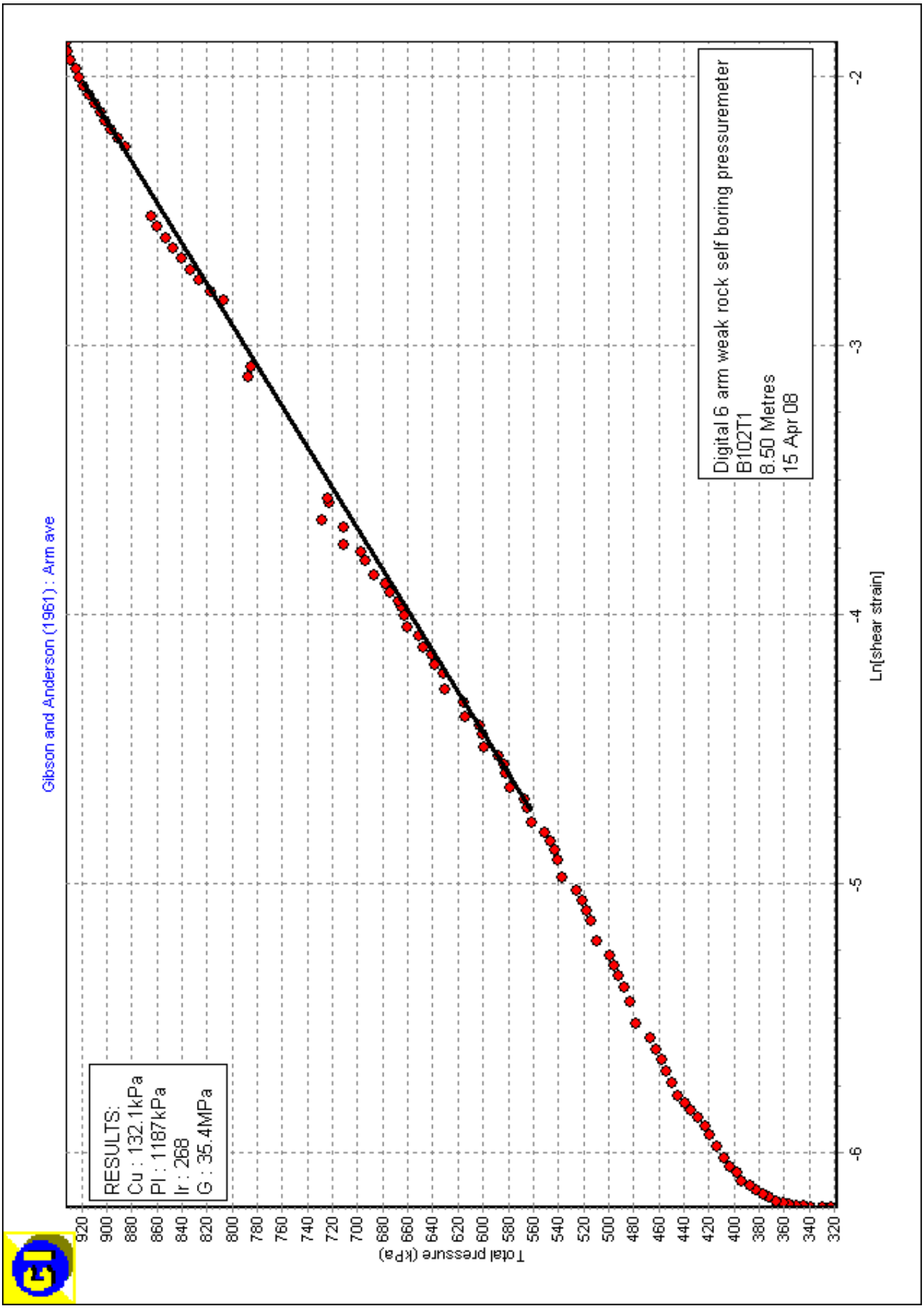
[PARAMETERS USED FOR UNDRAINED CURVE MODELLING]
Axis is Arm ave
Strain Origin (mm) : -0.05
Po (kPa) : 316
Cu (kPa) : 132.1
Limit pressure (kPa) : 1187
Non-linear exponent : 0.576
Calculated alpha (MPa) : 2.157
G at yield (MPa) : 16.9

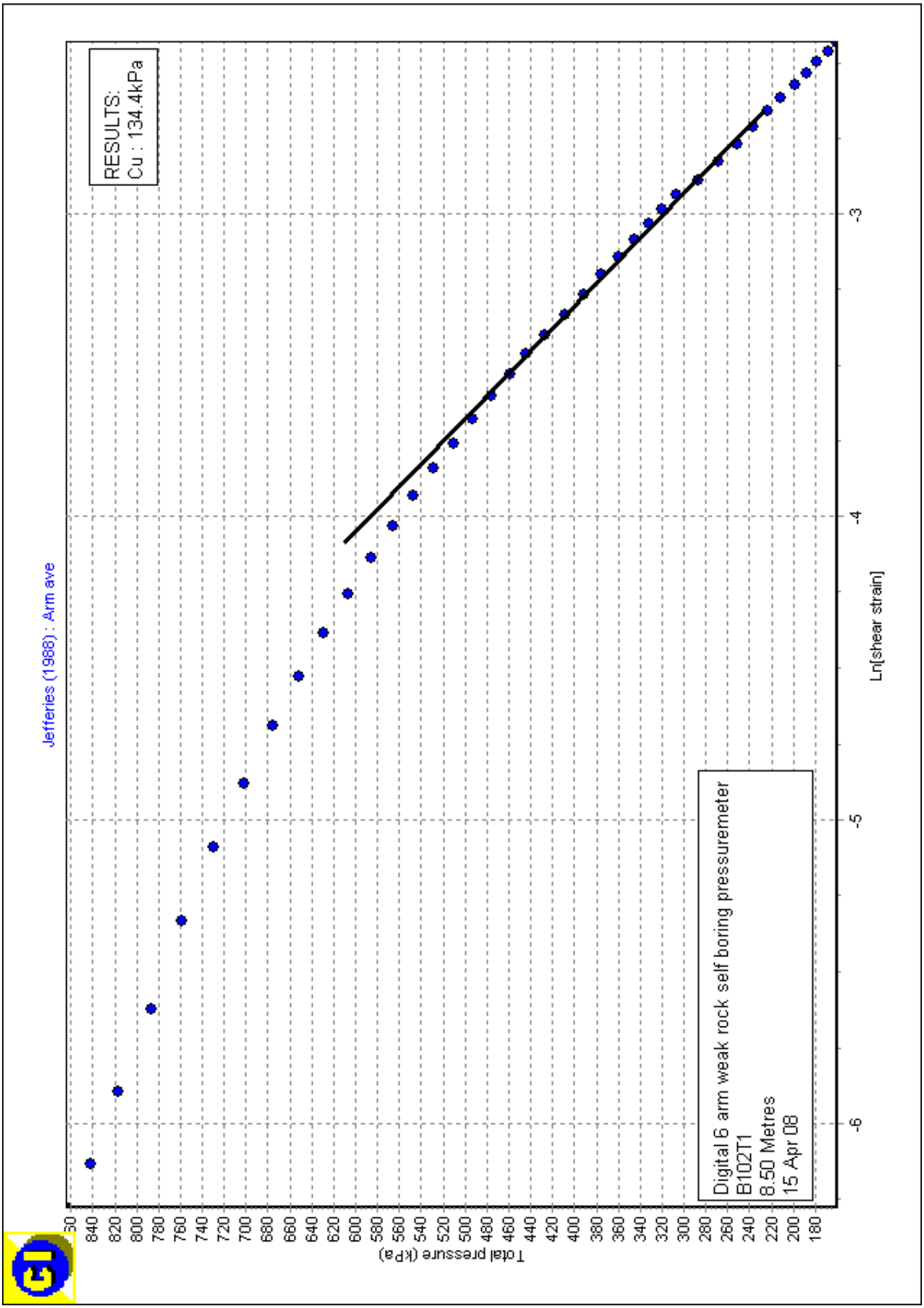

Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
Total pressure (kPa)
Cavity strain (%)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
1
2
3
4
5
6
7
8
9

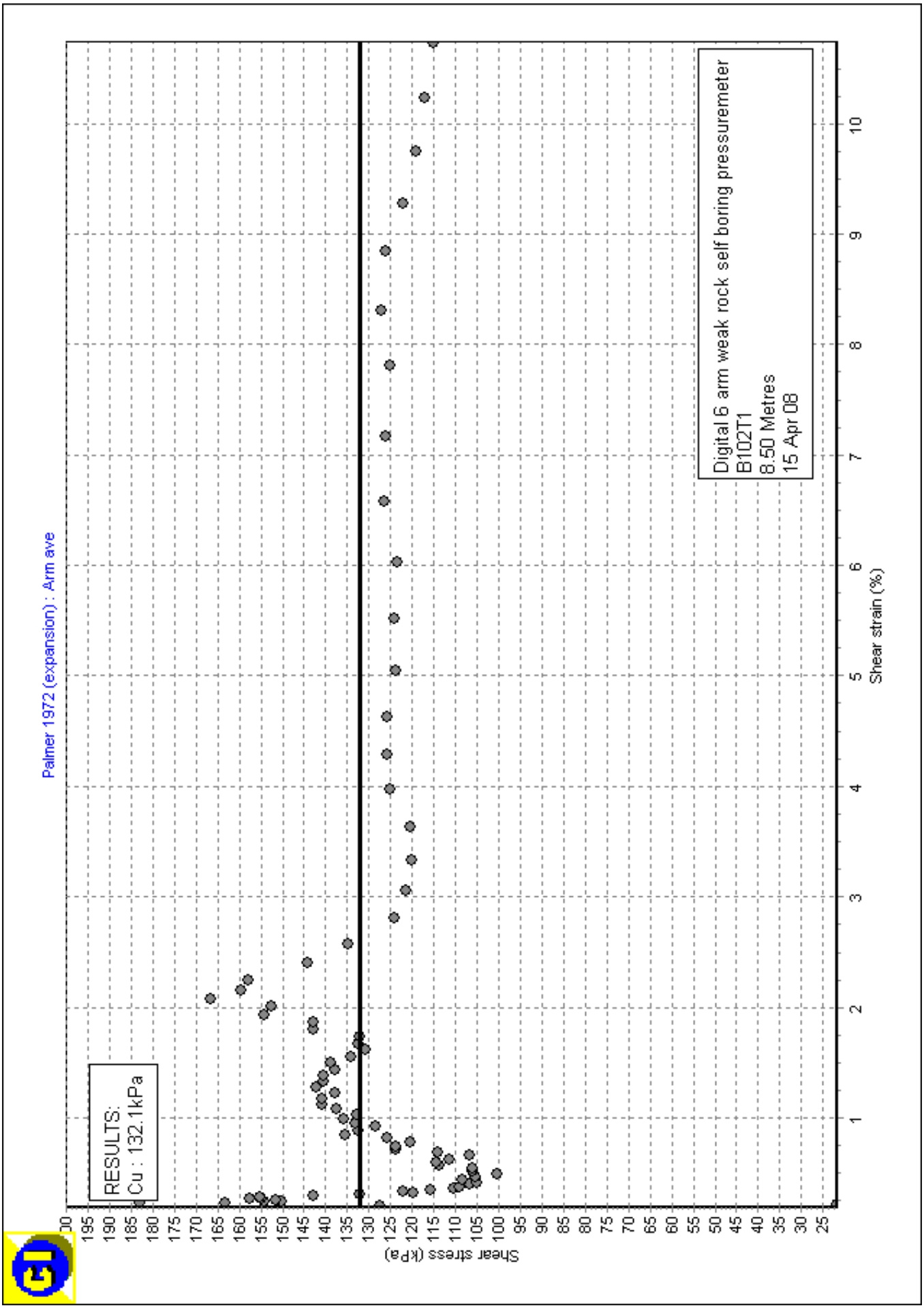

Lift-off analysis : Arm ave
RESULTS:
Lift off stress : 336.3kPa
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
Total pressure (kPa)
Radial Displacement (mm)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45

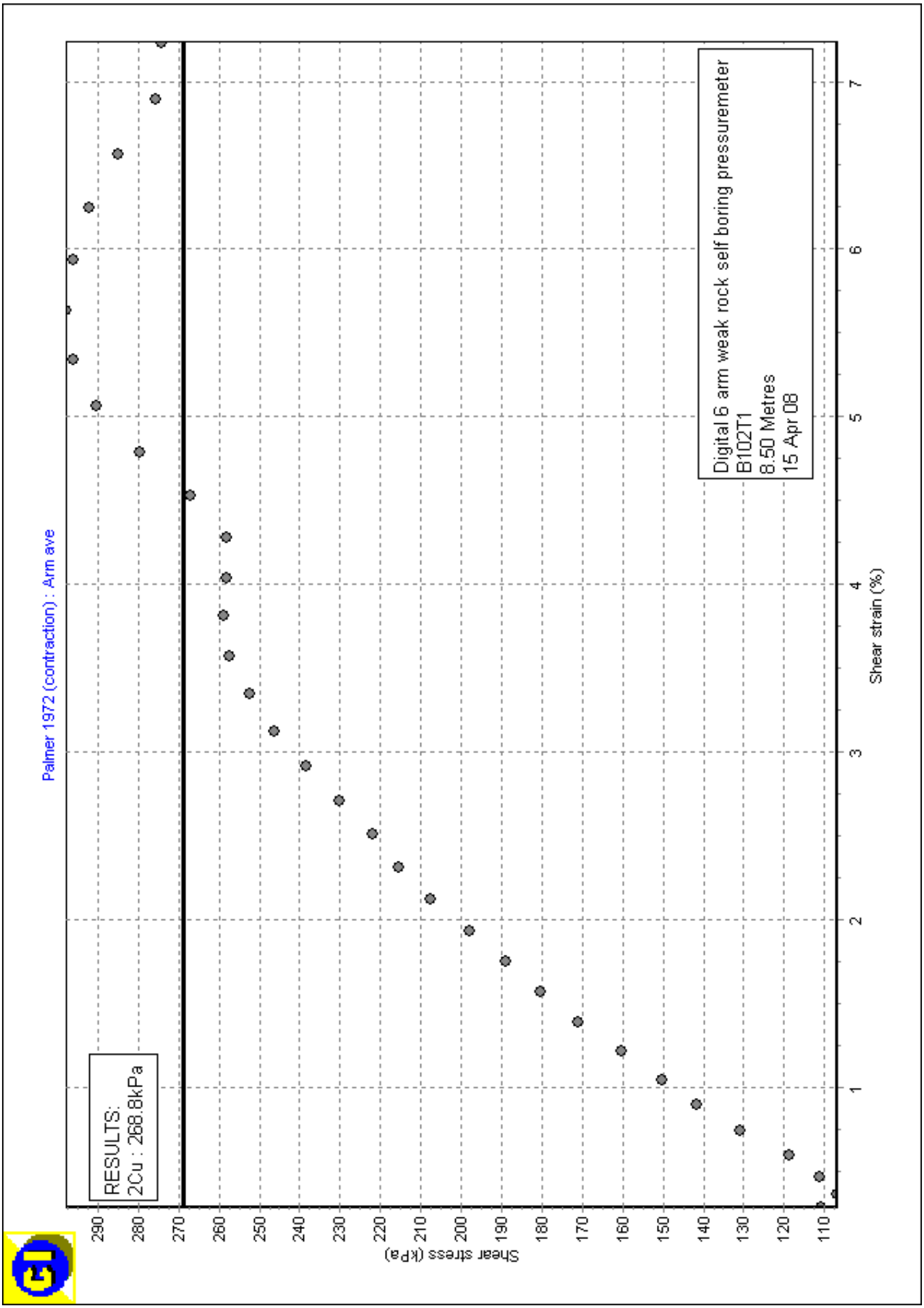

Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
RESULTS:
Gi : 21.2MPa
Pf : 541.0kPa
Po : 398.0kPa
Tf : 139.5kPa
Po + Tf : 537.6kPa
Origin : -0.041mm
Marsland and Randolph (1977) : Arm ave
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]

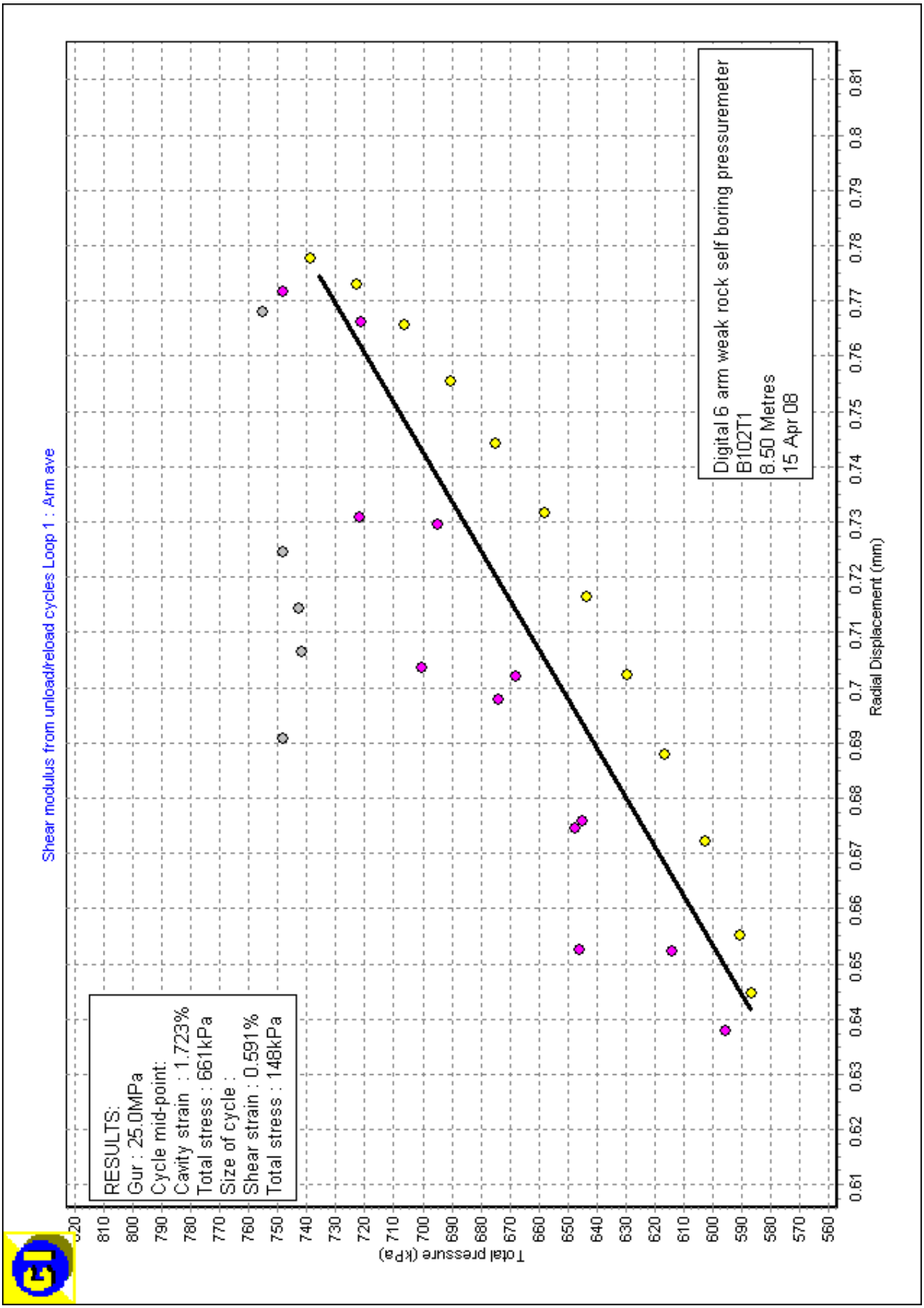

Excess PWP vs Total stress : PPC Ave
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
RESULTS:
Onset of excess pwp : 202.0kPa
Pore water pressure (kPa)
Total pressure (kPa)

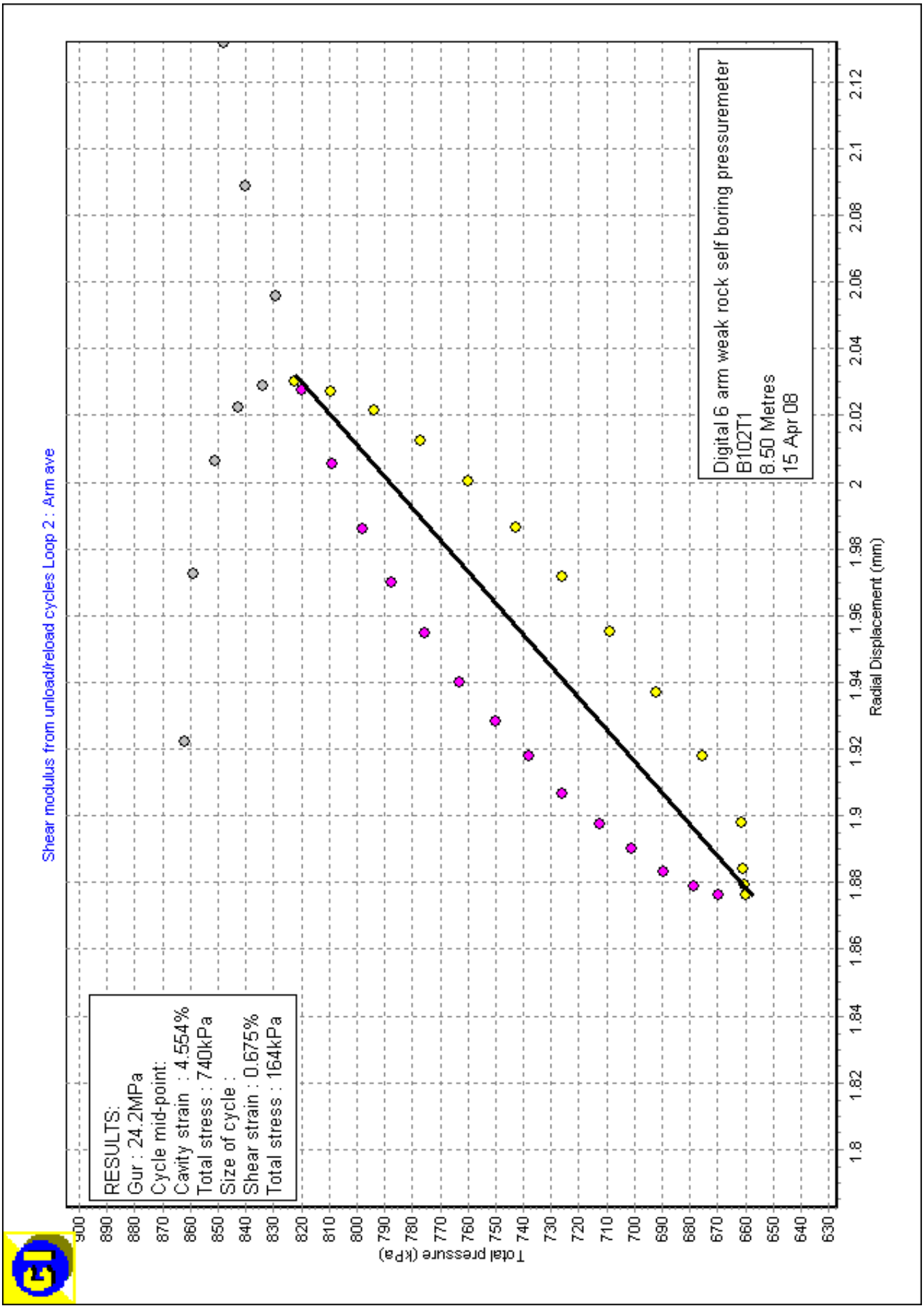

Gibson and Anderson (1961) : Arm ave
RESULTS:
Cu : 132.1kPa
Pl : 1187kPa
Ir : 268
G : 35.4MPa
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
Total pressure (kPa)
Ln[shear strain]

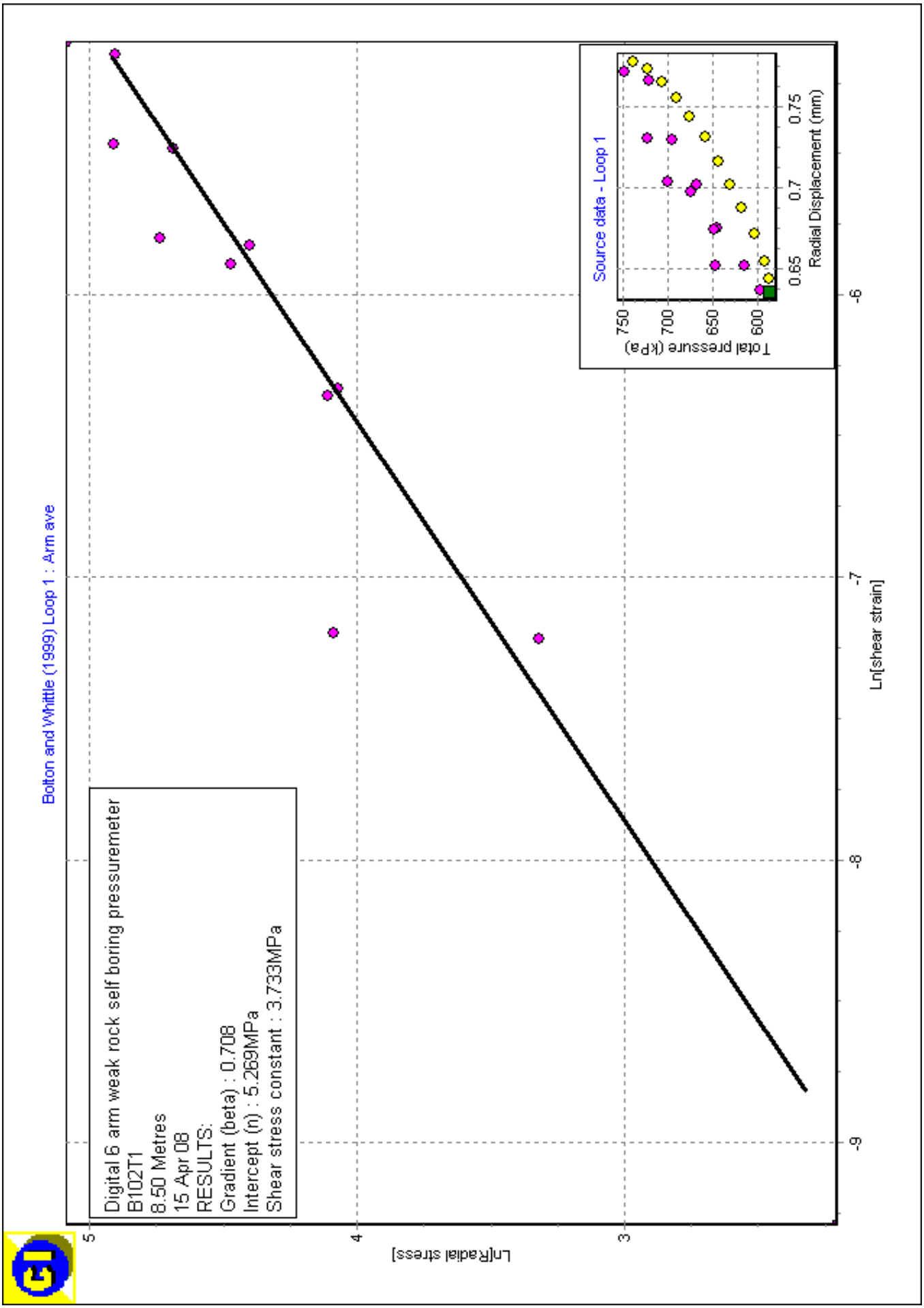

RESULTS:
Cu : 134.4kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
Total pressure (kPa)
Ln[shear strain]

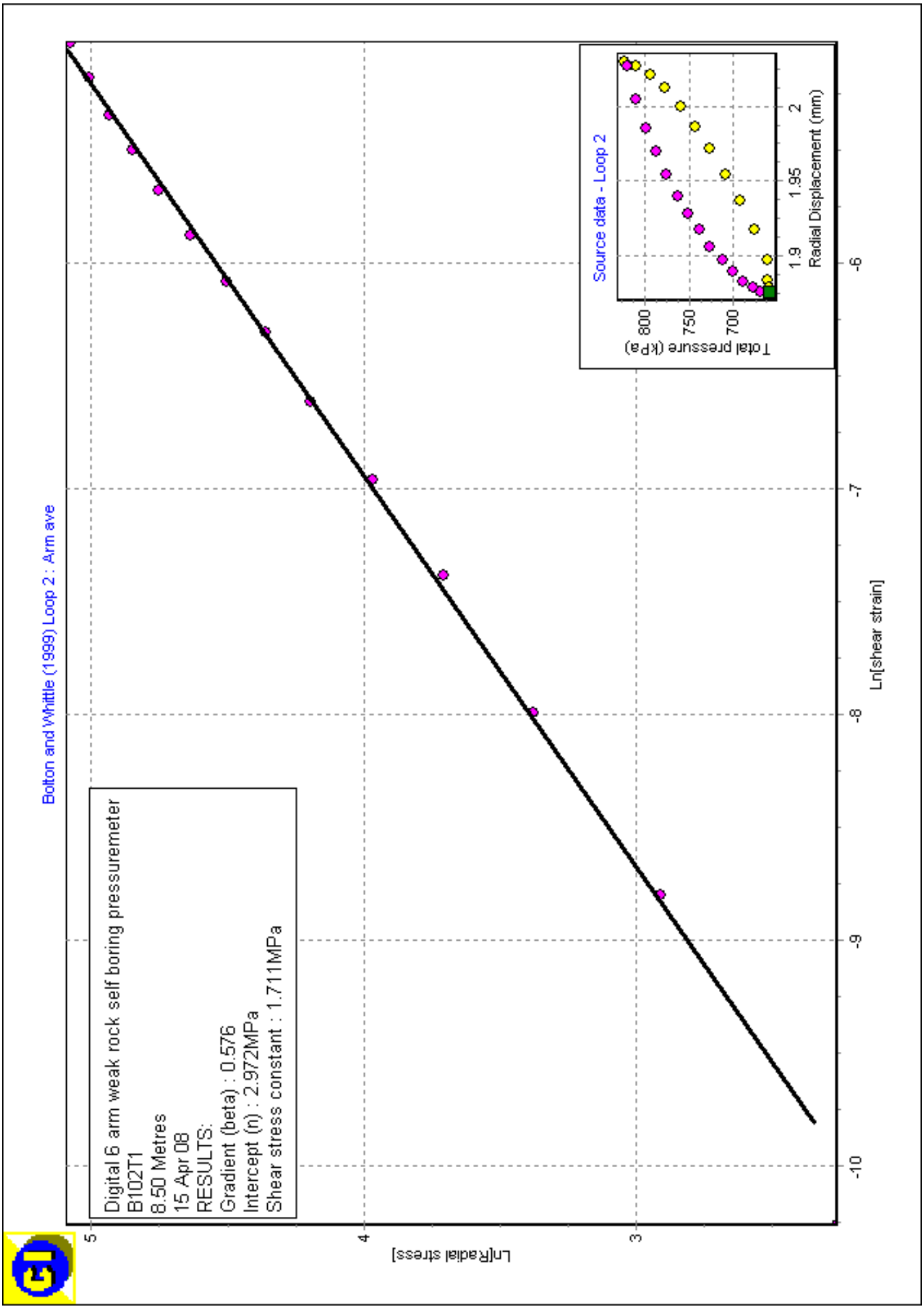

Palmer 1972 (expansion) : Arm ave
RESULTS:
Cu : 132.1kPa
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
Shear stress (kPa)
Shear strain (%)

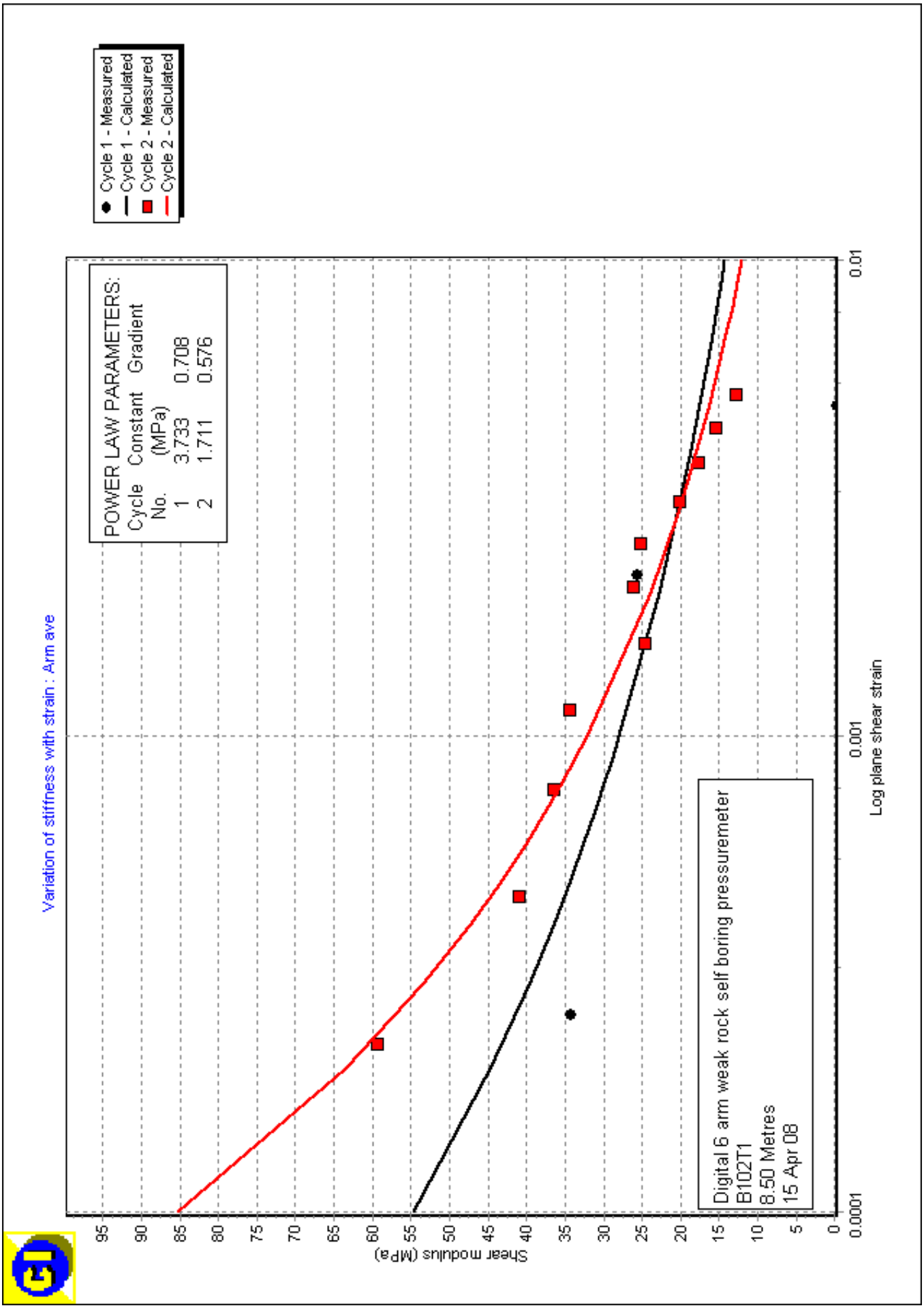

Palmer 1972 (contraction) : Arm ave
RESULTS:
2Cu : 268.8kPa
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
Shear stress (kPa)
Shear strain (%)

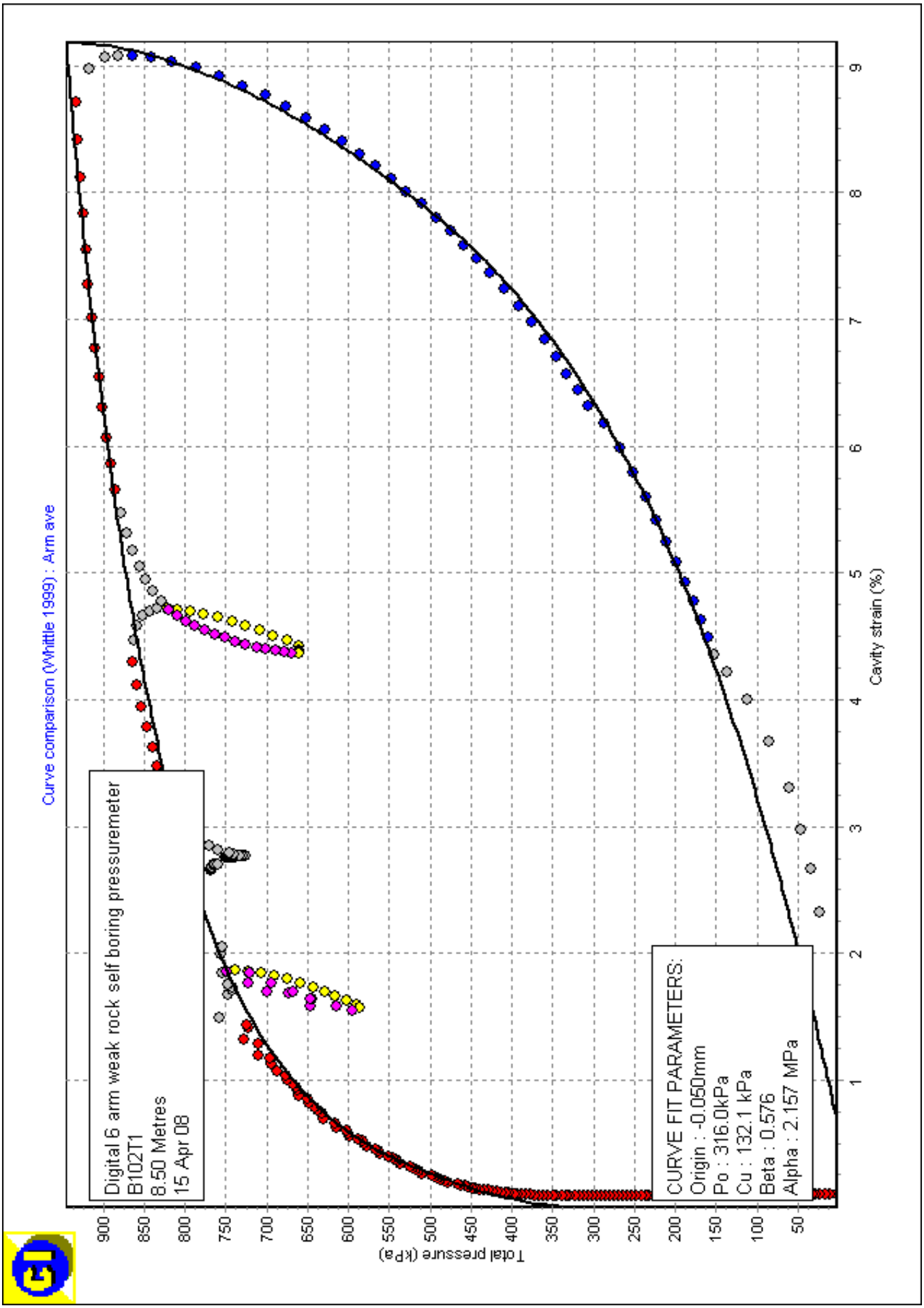

Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 25.0MPa
Cycle mid-point:
Cavity strain : 1.723%
Total stress : 661kPa
Size of cycle :
Shear strain : 0.591%
Total stress : 148kPa
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 24.2MPa
Cycle mid-point:
Cavity strain : 4.554%
Total stress : 740kPa
Size of cycle :
Shear strain : 0.675%
Total stress : 164kPa
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
RESULTS:
Gradient (beta) : 0.708
Intercept (n) : 5.269MPa
Shear stress constant : 3.733MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 1
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 2 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
RESULTS:
Gradient (beta) : 0.576
Intercept (n) : 2.972MPa
Shear stress constant : 1.711MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)


Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
POWER LAW PARAMETERS:
Cycle No.
Constant (MPa)
Gradient
1 3.733 0.708
2 1.711 0.576
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
0.0001
0.001
0.01
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08


Curve comparison (Whittle 1999) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T1
8.50 Metres
15 Apr 08
CURVE FIT PARAMETERS:
Origin : -0.050mm
Po : 316.0kPa
Cu : 132.1 kPa
Beta : 0.576
Alpha : 2.157 MPa
Total pressure (kPa)
Cavity strain (%)

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
DENMARK PLACE	15/4/08	TUES	102	1	8.5

Weather:- F, NS Material:- LONDON CLAY

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
	10:45	11.12	8.0 – 9.0	1m / 20 min	70BARS.

Ground level :- Orientation:-

Water Press.	Inst.OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
200Ri	85.1	89.1	73 R-R	5mm BACK	'MOLLY'

Drilling Remarks:- EASY

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
16/min	2 (m)	6 SEC	3000Ri	11.8	TRIG	10mPa.

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-115	91	-13	81	-92	123	-1024	-923	-2453	Ground Level Zeros
									Pre-drilling Zeros
-128	109	-44	2.8	-100	107	-1024	-905	-2462	Post-drilling Zeros
									Pre-test Zeros
									Ground Level Zeros

Test starts:- 11:16.

Line	Notes
352	LOOP 1 NO Herb — SCJ NOT WORKING WELL, SWITCHED TO MANUAL
436	LOOP 2 – VERY NICE.
486	UNLOAD

Test ends:- 11:55 Max Press:- 932

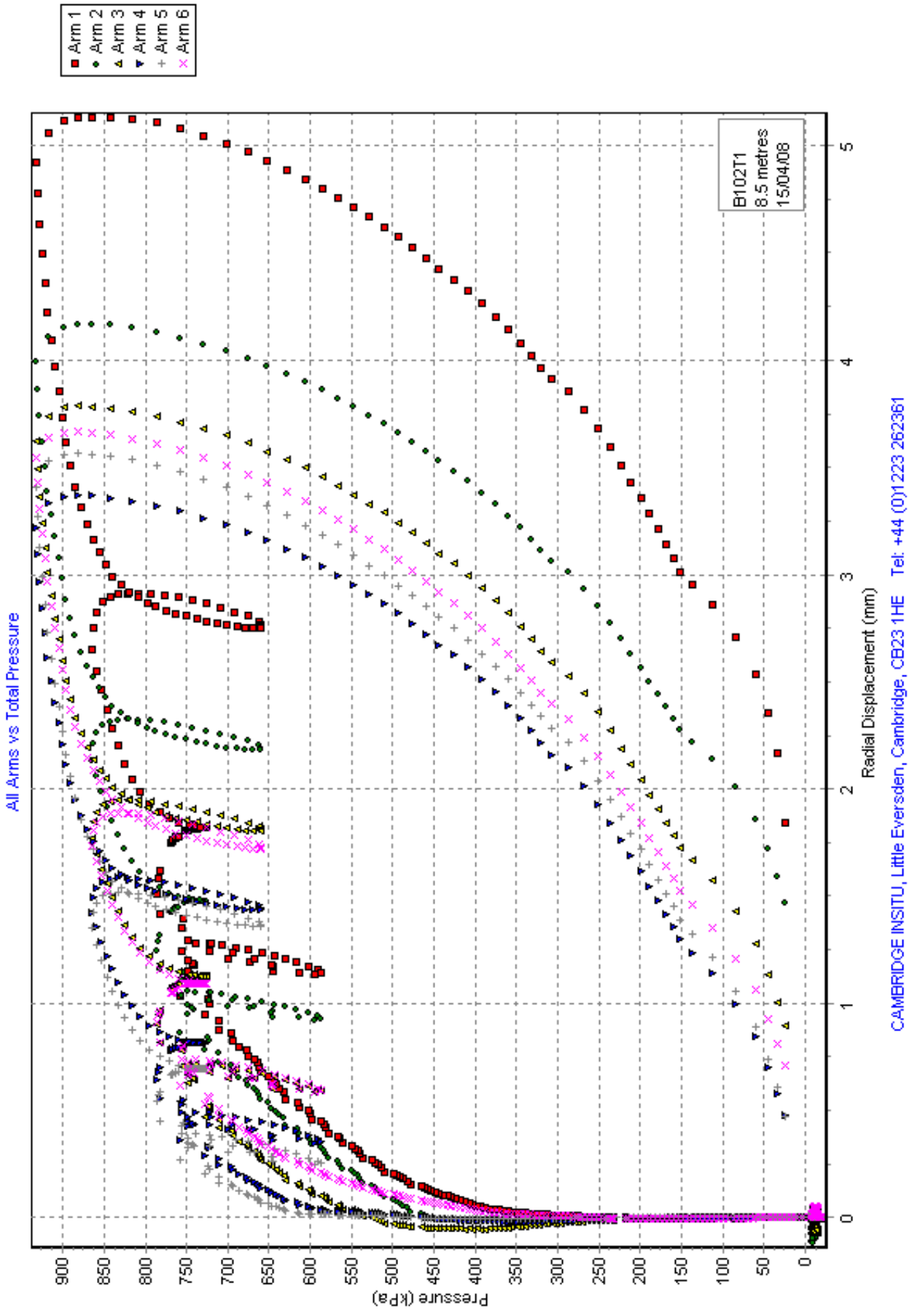
Calibrated Data details:

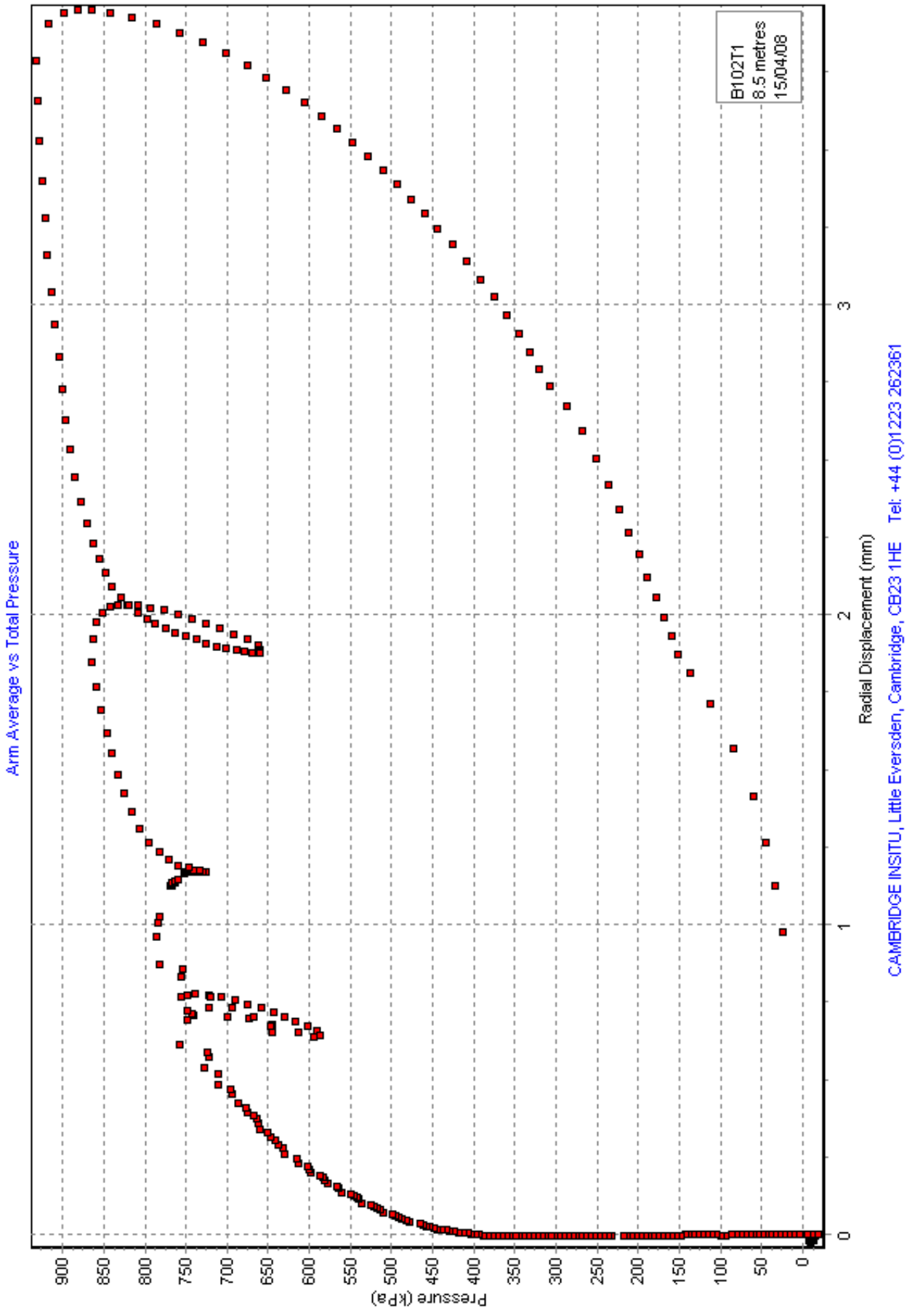
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
W0130T1	W0130T2.	10/4/08	11/4/08.

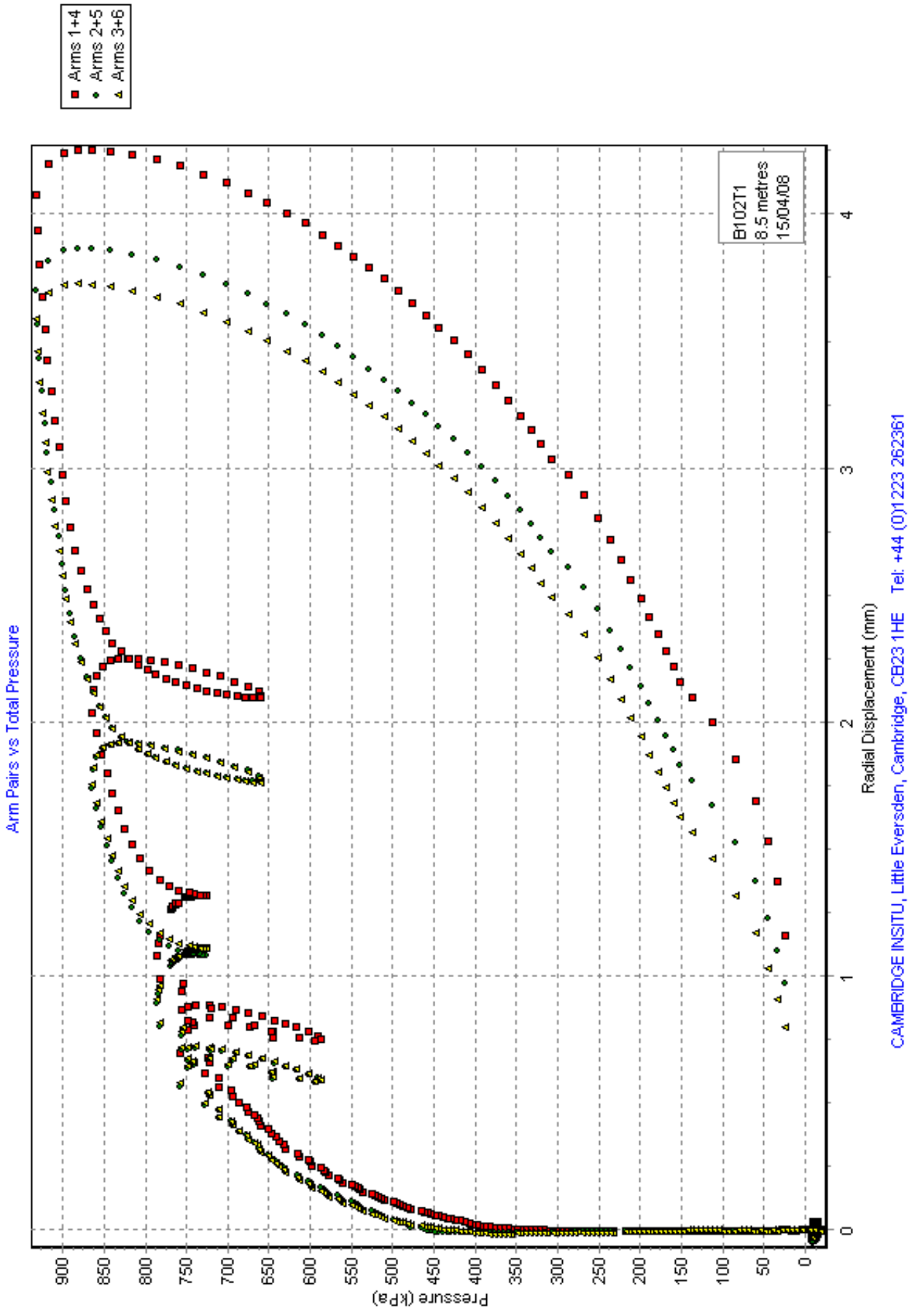
TEST REMARKS: Pushed things a bit because of battery problems. Retention of PPC zero is Az -1070 Bz = -920.

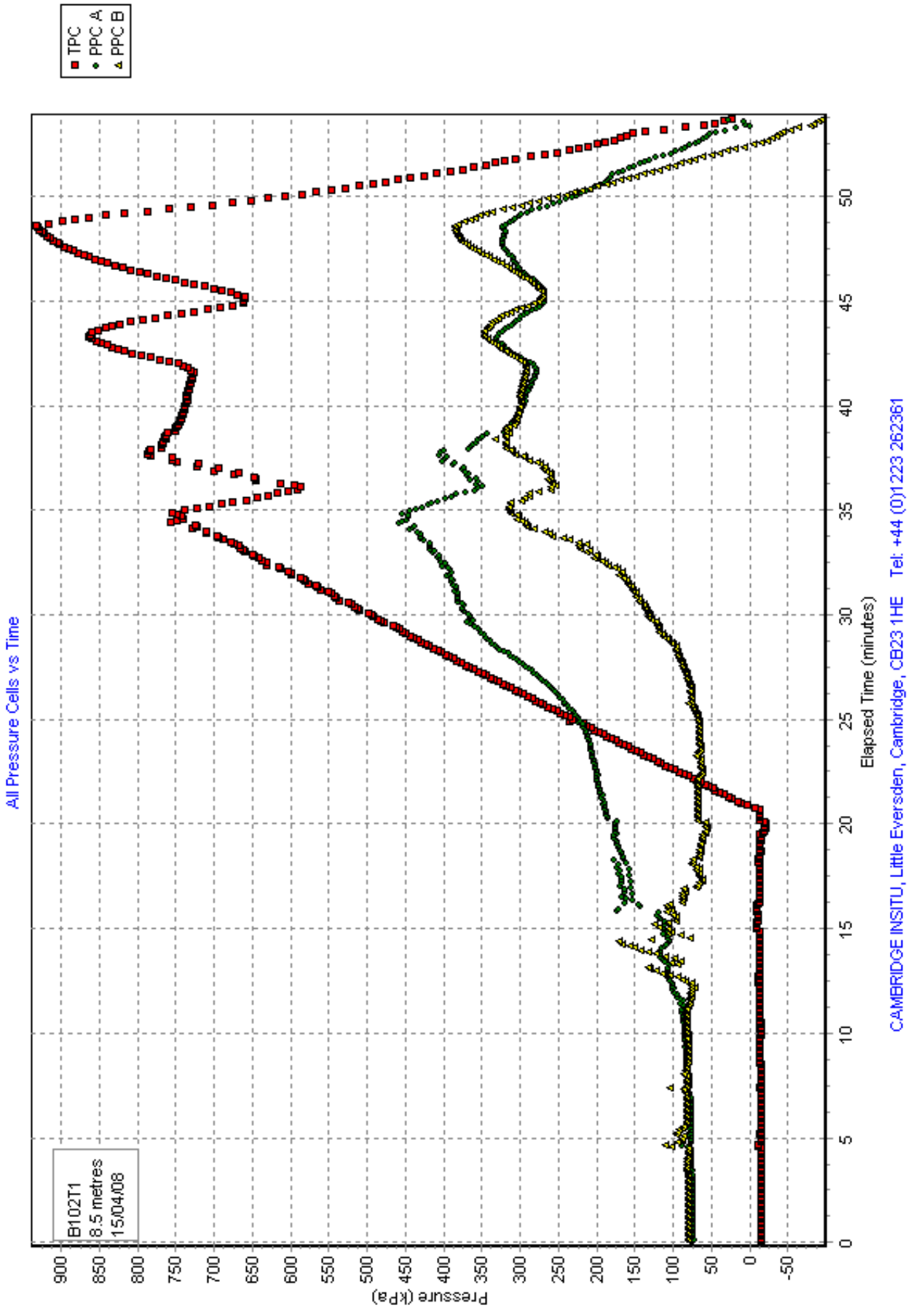
Driller: SAMMY

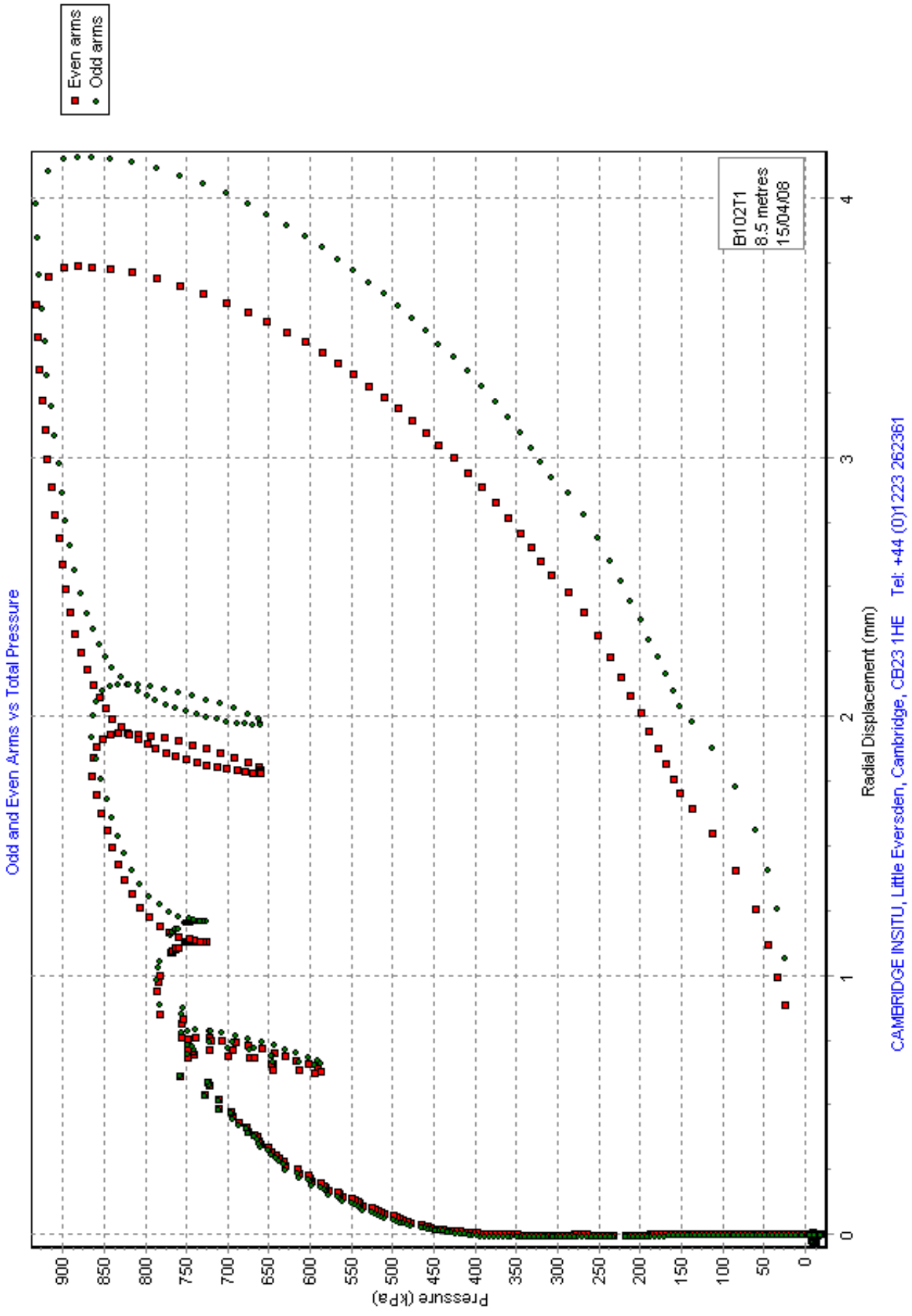
Tester: RW.


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
B102T1
8.5 metres
15/04/08
All Arms vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
B102T1
8.5 metres
15/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arms 1+4
Arms 2+5
Arms 3+6
B102T1
8.5 metres
15/04/08
Arm Pairs vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


TPC
PPC A
PPC B
All Pressure Cells vs Time
B102T1
8.5 metres
15/04/08
Pressure (kPa)
Elapsed Time (minutes)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T1
8.5 metres
15/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361

B102T2 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]
Project : 36237
Site : Denmark Place
Borehole : BH102
Test name : B102T2
Test date : 15 Apr 08
Test depth : 14.00 Metres
Water table : 5.6 Metres
Ambient PWP : 82.4 kPa
Material : London Clay
Probe : Digital 6 arm weak rock self boring pressuremeter
Diameter : 88.1 mm
Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out
The file includes results from a curve fitting analysis

Analysed by RWW on 16 Apr 08

Remarks: Start drilling 14:24

[RESULTS FOR CAVITY REFERENCE PRESSURE]
Strain Origin (mm) : "Arm ave=0.050"
Po from Marsland & Randolph (kPa) : "Arm ave=360.6"
Po from Lift off (kPa) : "Arm ave=324.3"
PWP versus Total Stress (kPa) : "PPC Ave=405.6"
Best estimate of Po (kPa) : "Arm ave=375.0"

[UNDRAINED STRENGTH PARAMETERS]
Gibson & Anderson 1961 - Cu (kPa) : "Arm ave=133.4"
Limit pressure (kPa) : "Arm ave=1273"
Jefferies 1988 - Cu (kPa) : "Arm ave=136.3"
Undrained yield stress (kPa) : "Arm ave=494.1"

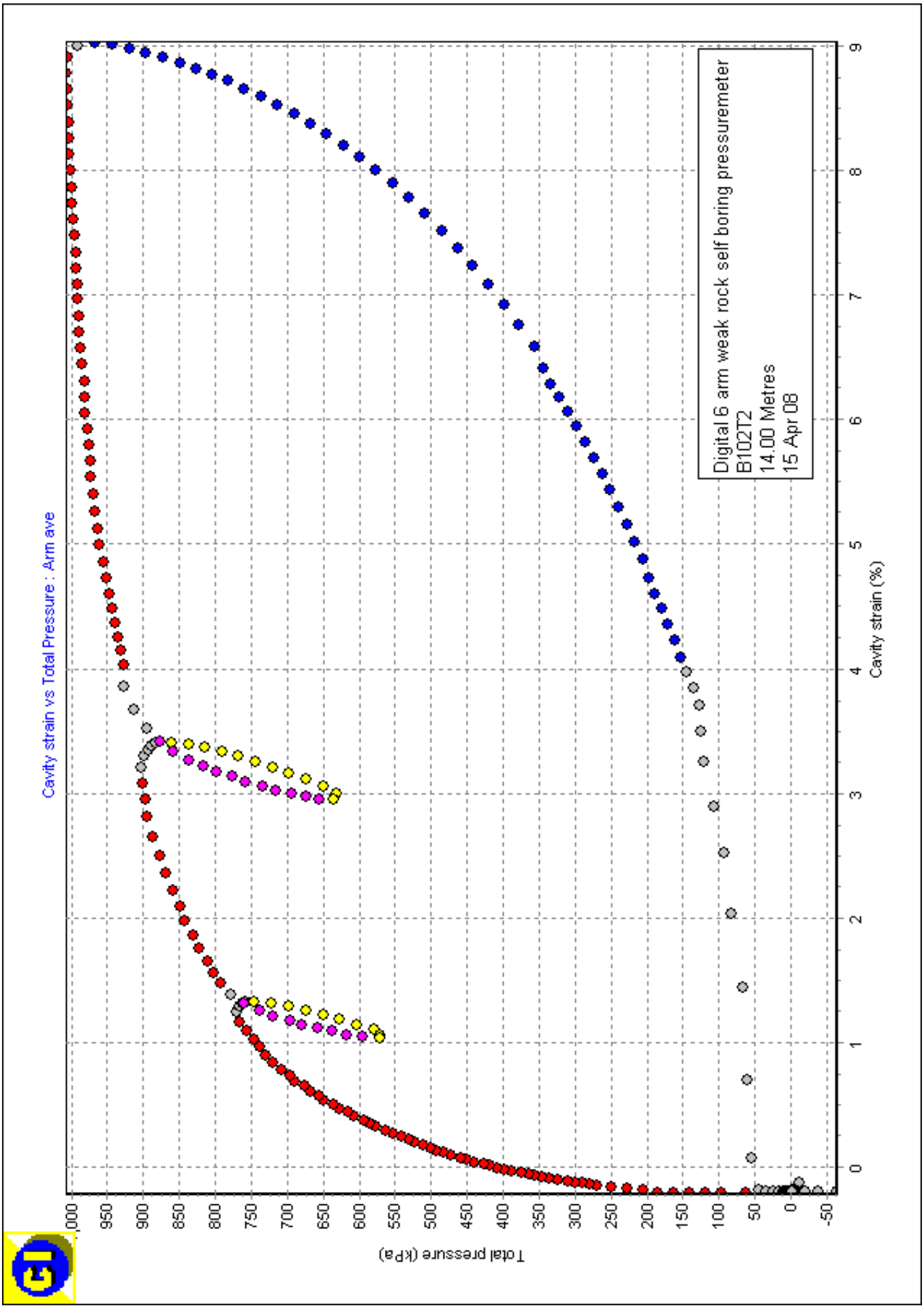
[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=31.7"

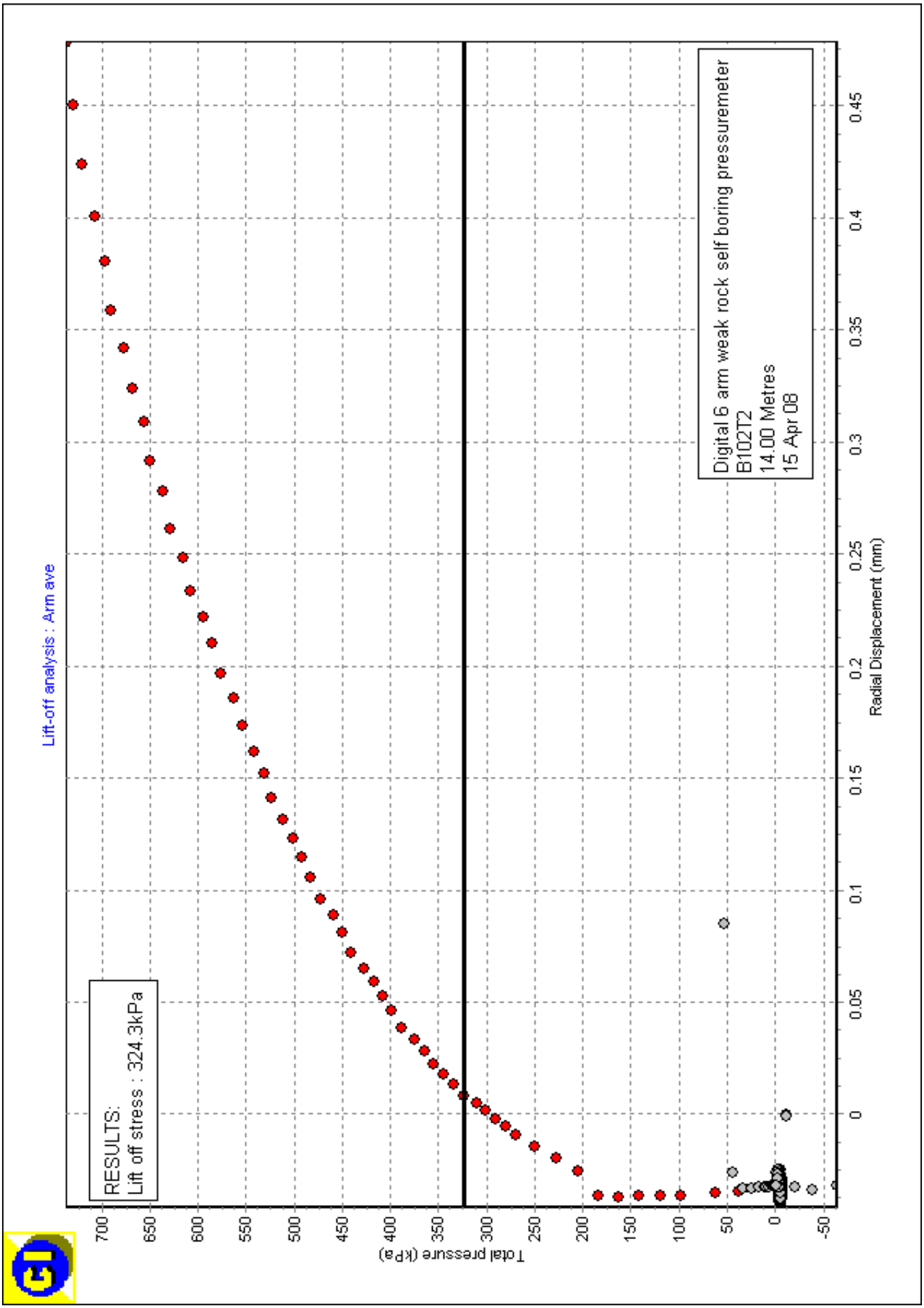
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	34.2	1.191	661	0.570	195
Arm ave	2	27.4	3.200	756	0.867	238

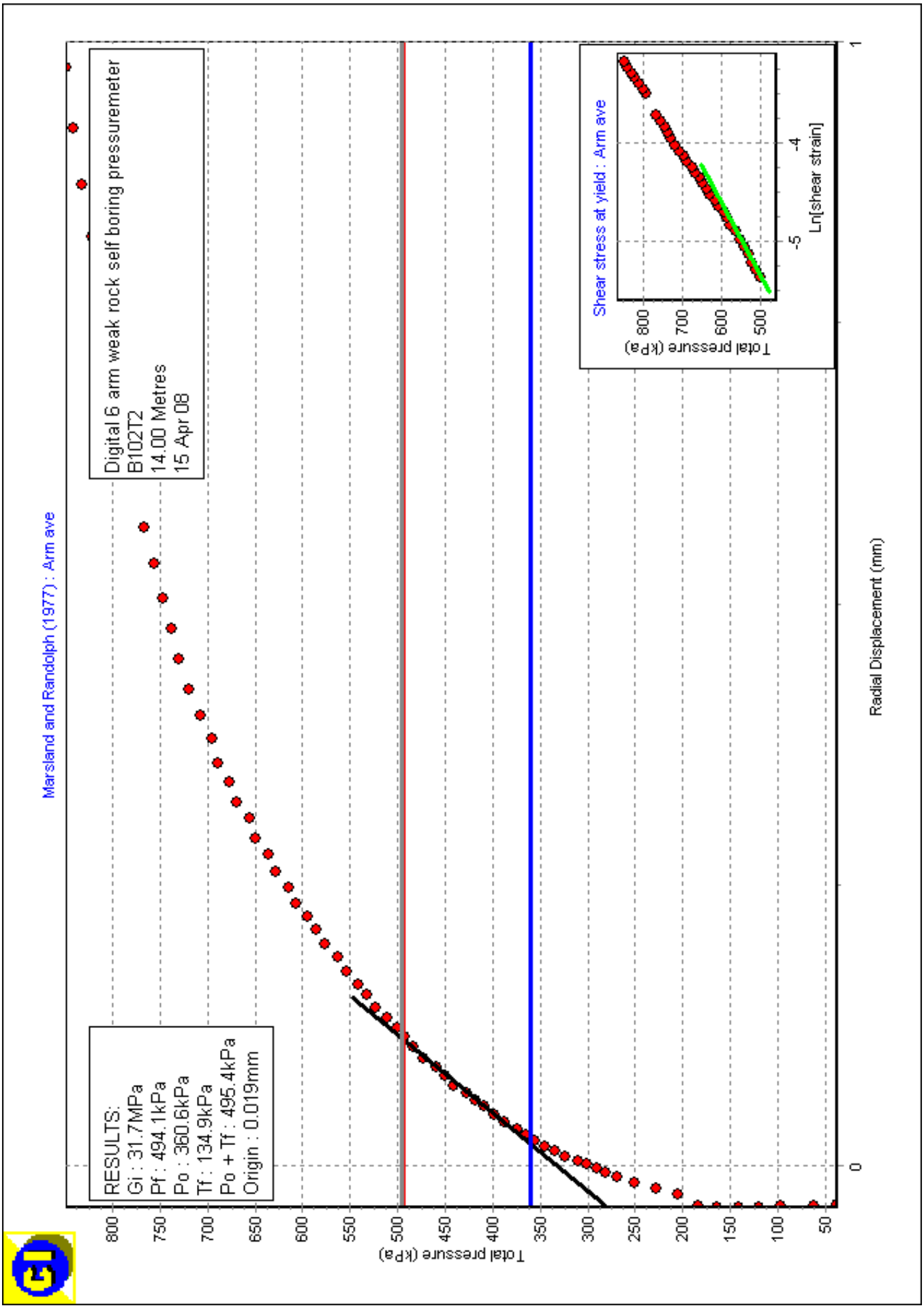
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

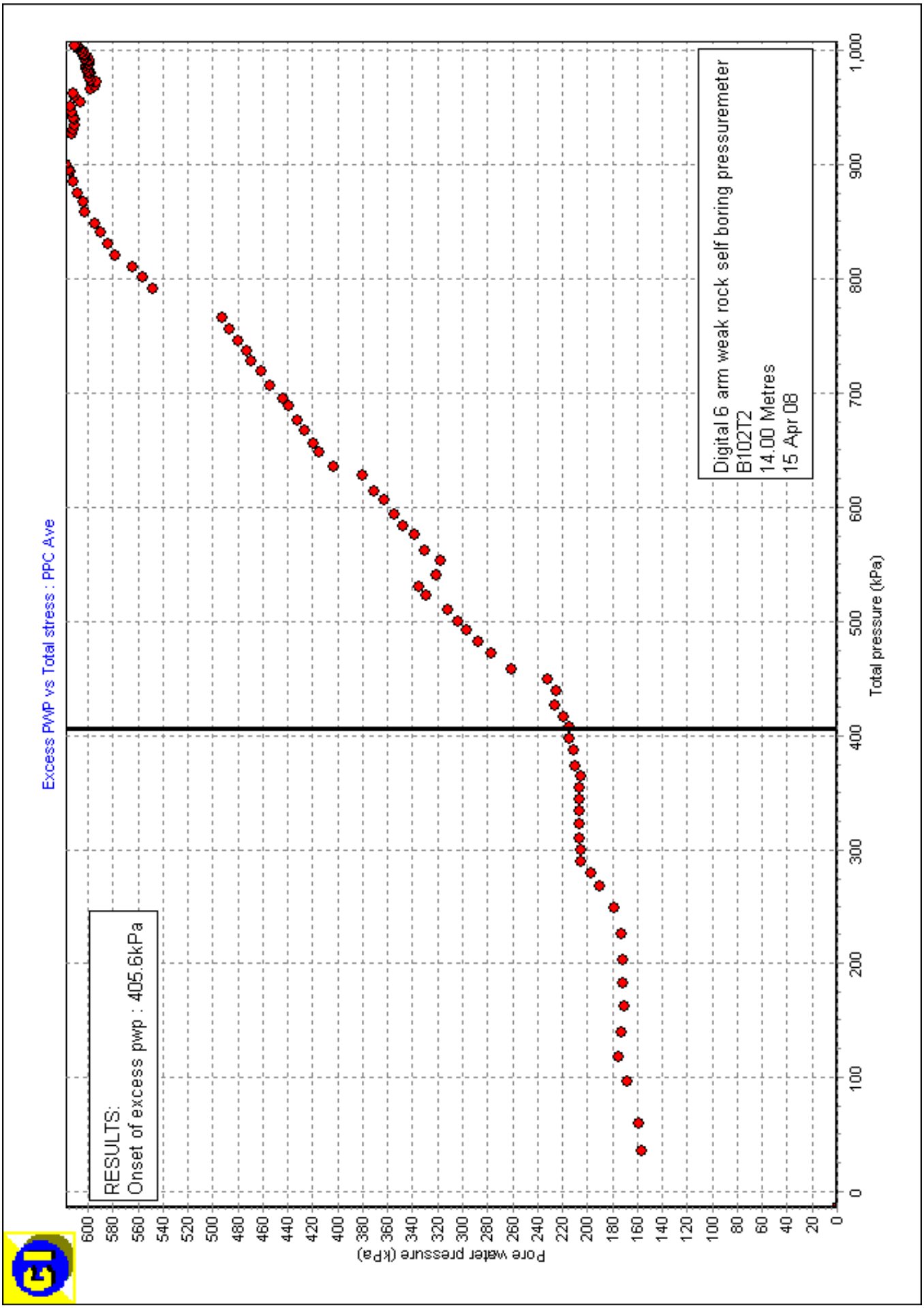
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	4.911	3.076	0.626
Arm ave	2	5.182	3.292	0.635

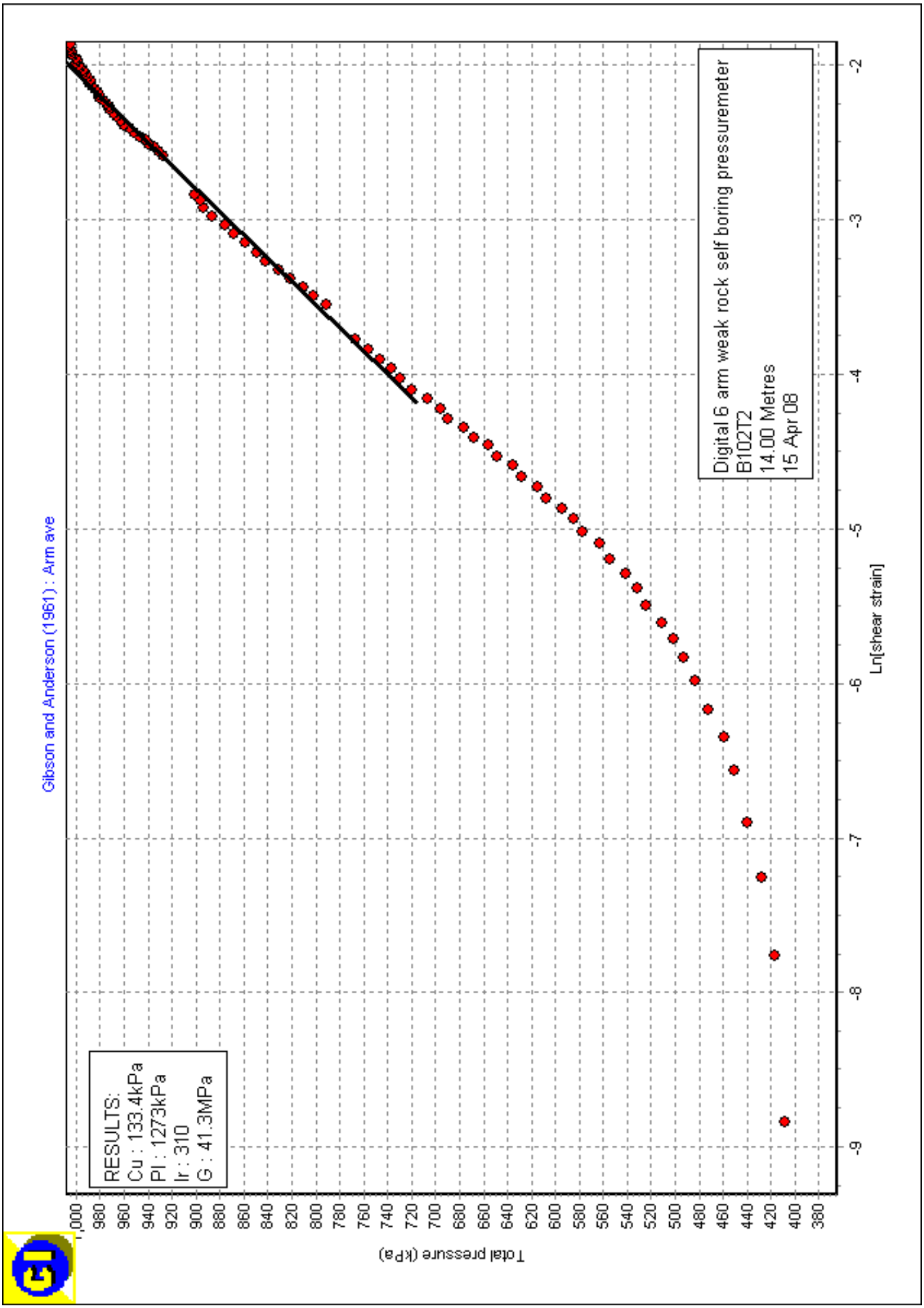
[PARAMETERS USED FOR UNDRAINED CURVE MODELLING]
Axis is Arm ave
Strain Origin (mm) : 0.05
Po (kPa) : 375
Cu (kPa) : 133.4
Limit pressure (kPa) : 1273
Non-linear exponent : 0.635
Calculated alpha (MPa) : 3.539
G at yield (MPa) : 23.3

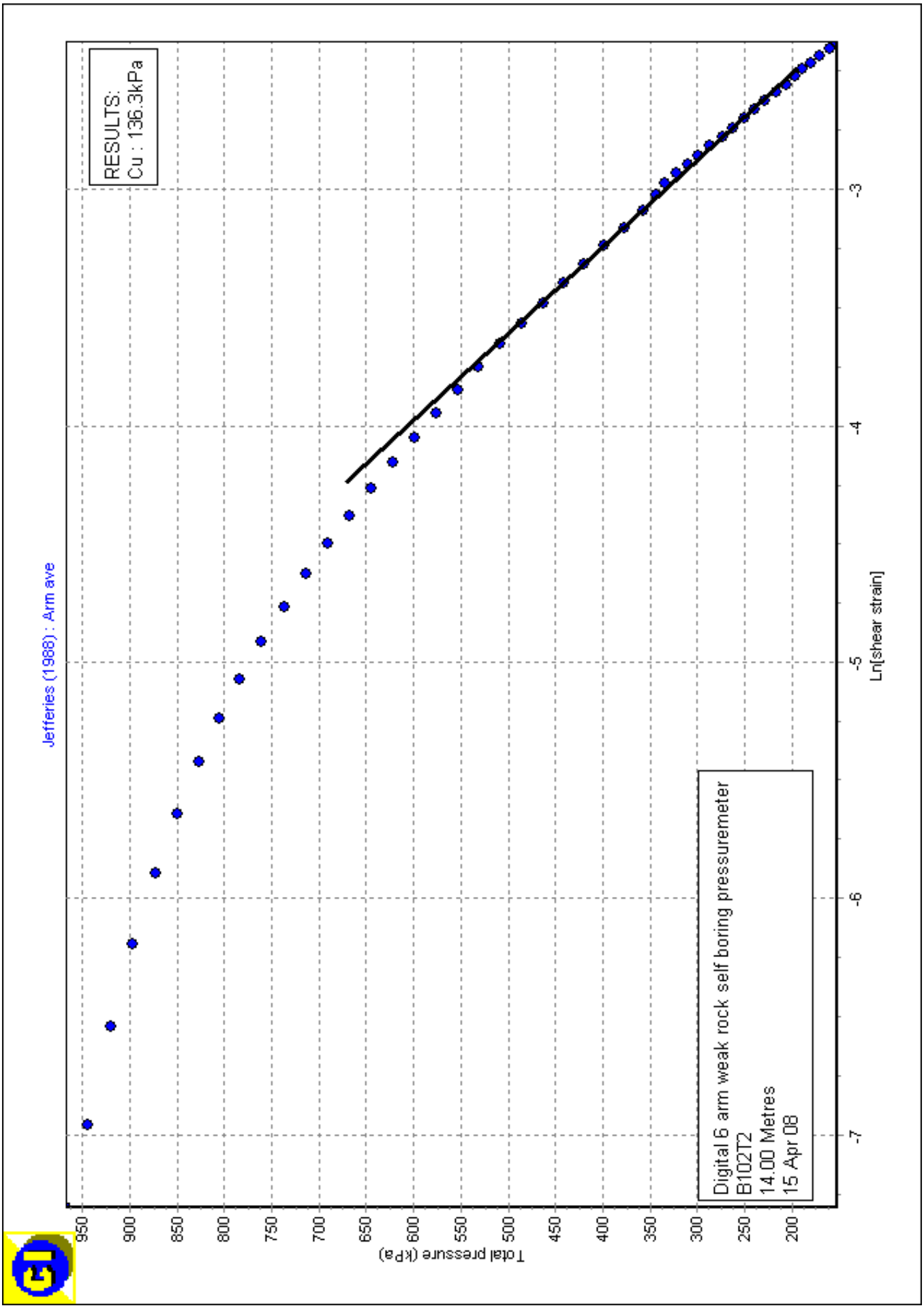

Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Total pressure (kPa)
Cavity strain (%)
-50
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
0
1
2
3
4
5
6
7
8
9

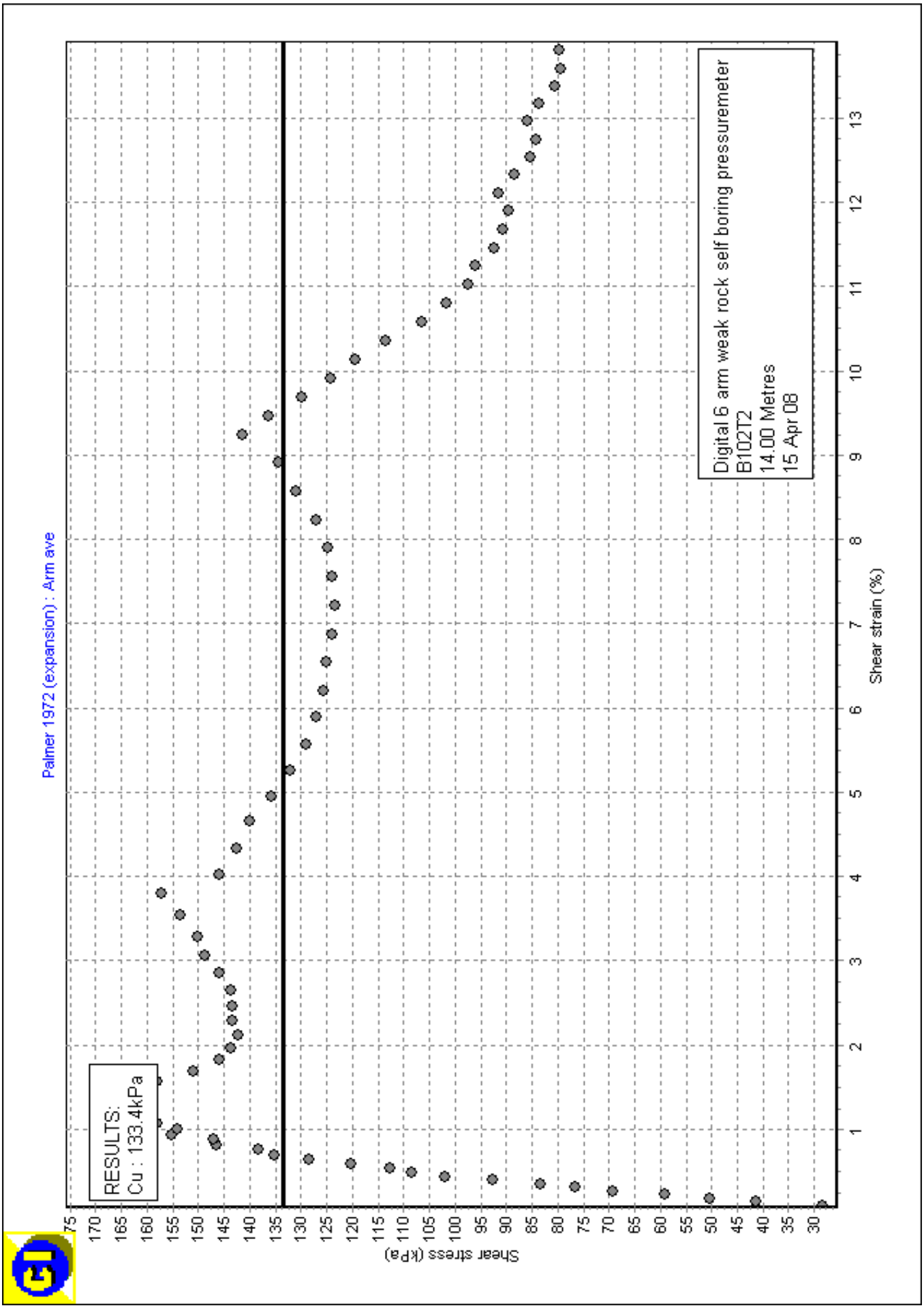

Lift-off analysis : Arm ave
RESULTS:
Lift off stress : 324.3kPa
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Total pressure (kPa)
Radial Displacement (mm)
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45

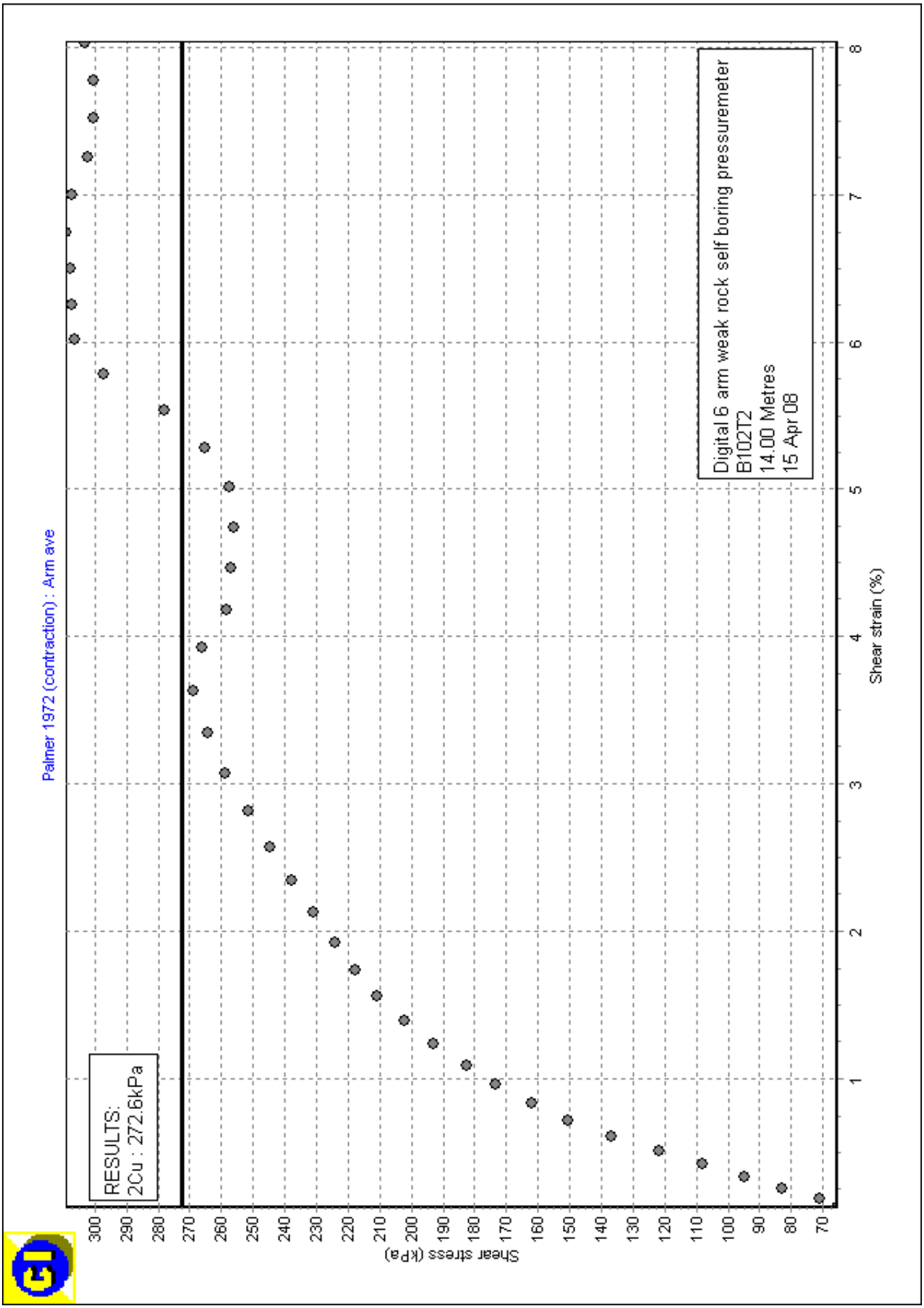

Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
RESULTS:
Gi : 31.7MPa
Pf : 494.1kPa
Po : 360.6kPa
Tf : 134.9kPa
Po + Tf : 495.4kPa
Origin : 0.019mm
Marsland and Randolph (1977) : Arm ave
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]

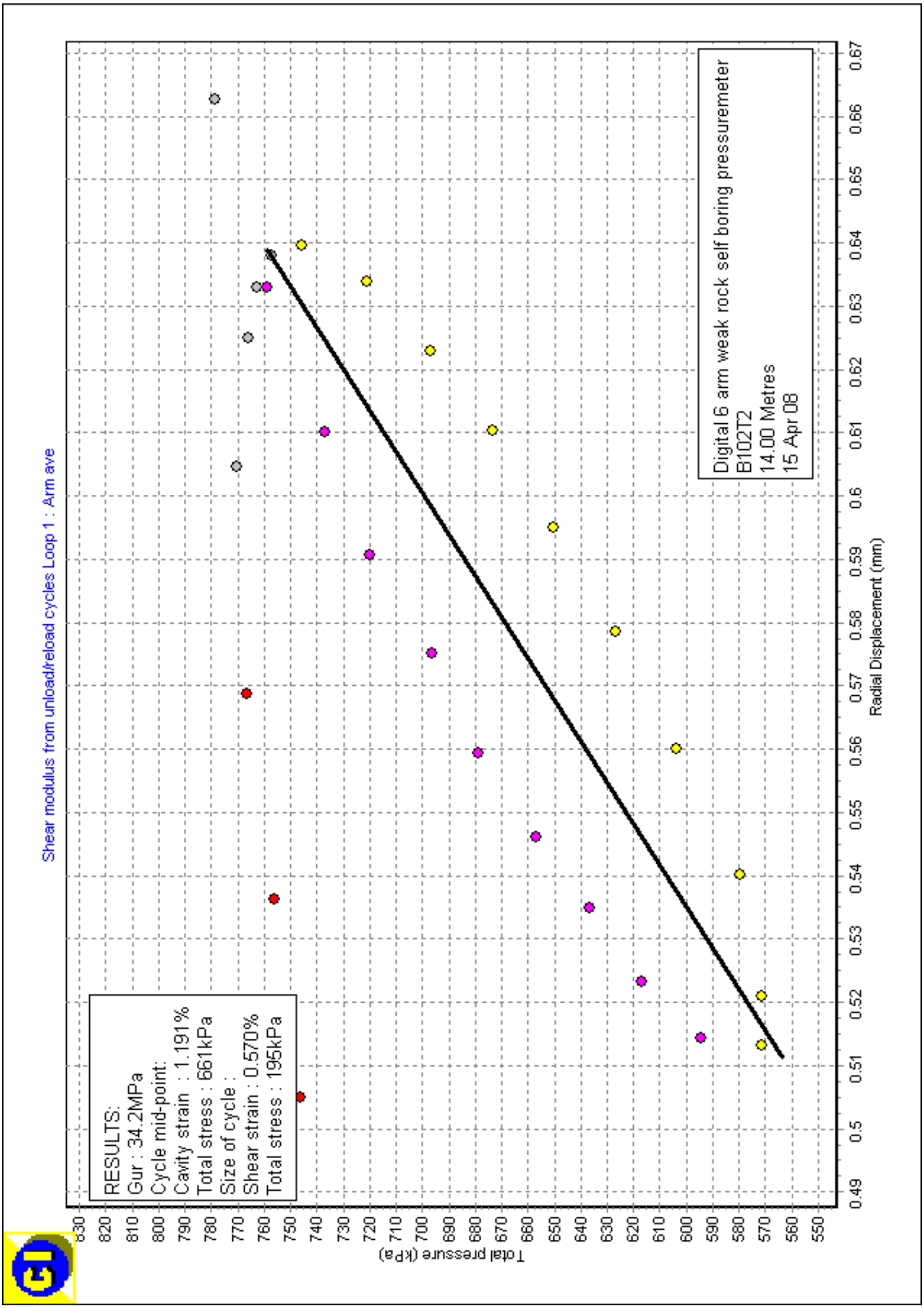

Excess PWP vs Total stress : PPC Ave
RESULTS:
Onset of excess pwp : 405.6kPa
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Pore water pressure (kPa)
Total pressure (kPa)

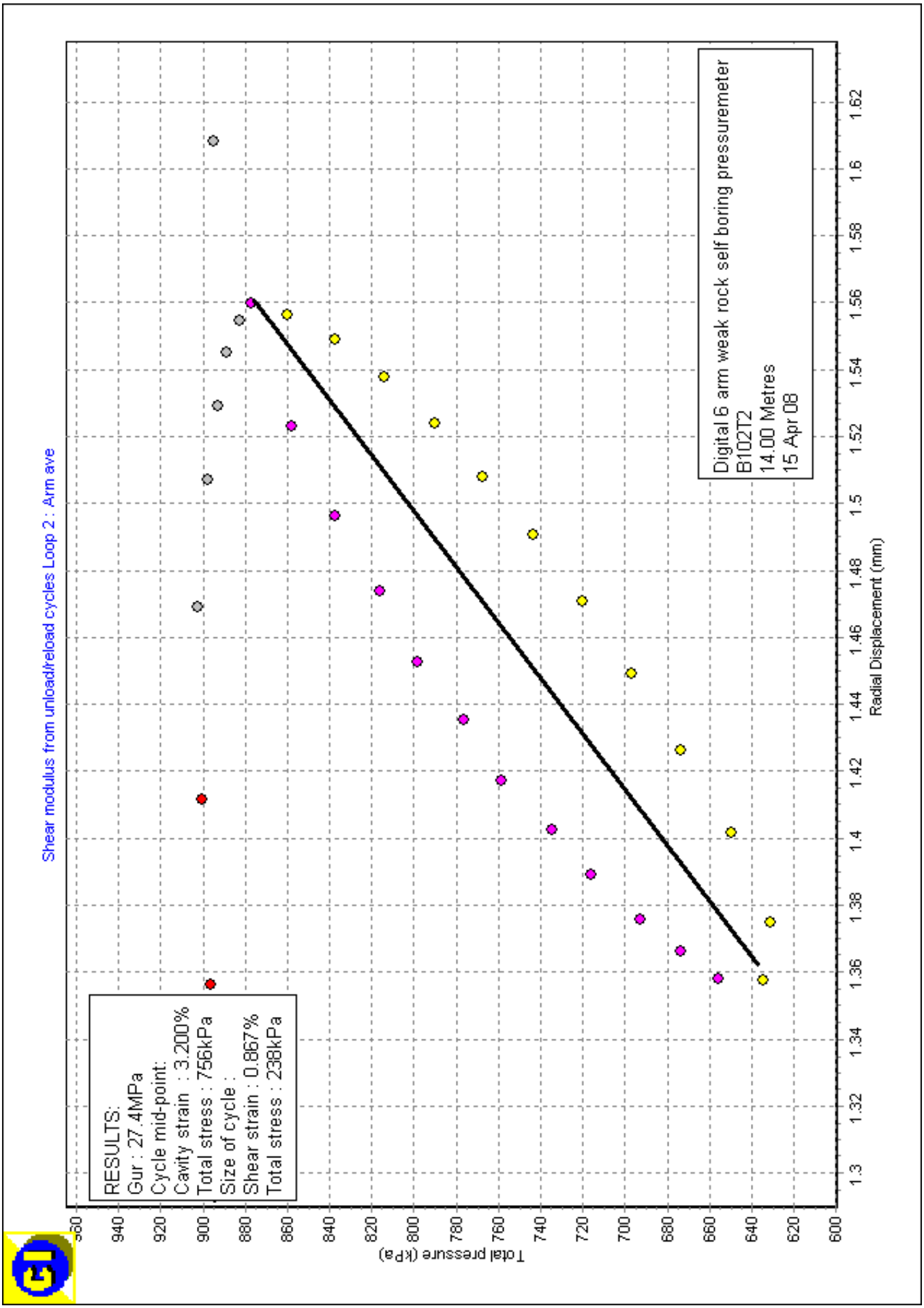

Gibson and Anderson (1961) : Arm ave
RESULTS:
Cu : 133.4kPa
PI : 1273kPa
Ir : 310
G : 41.3MPa
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Total pressure (kPa)
Ln[shear strain]

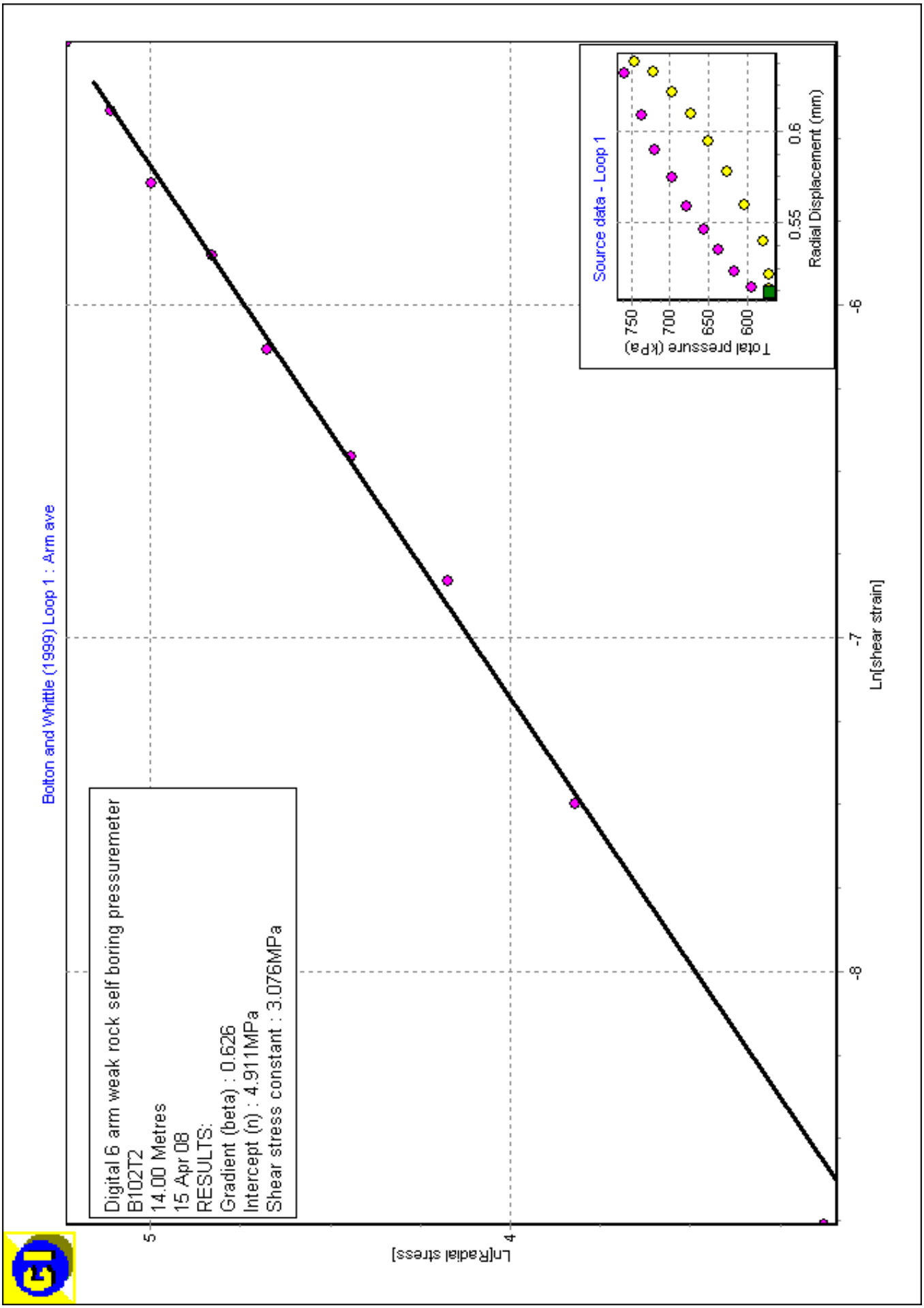

RESULTS:
Cu : 136.3kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Total pressure (kPa)
Ln[shear strain]
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
-3
-4
-5
-6
-7

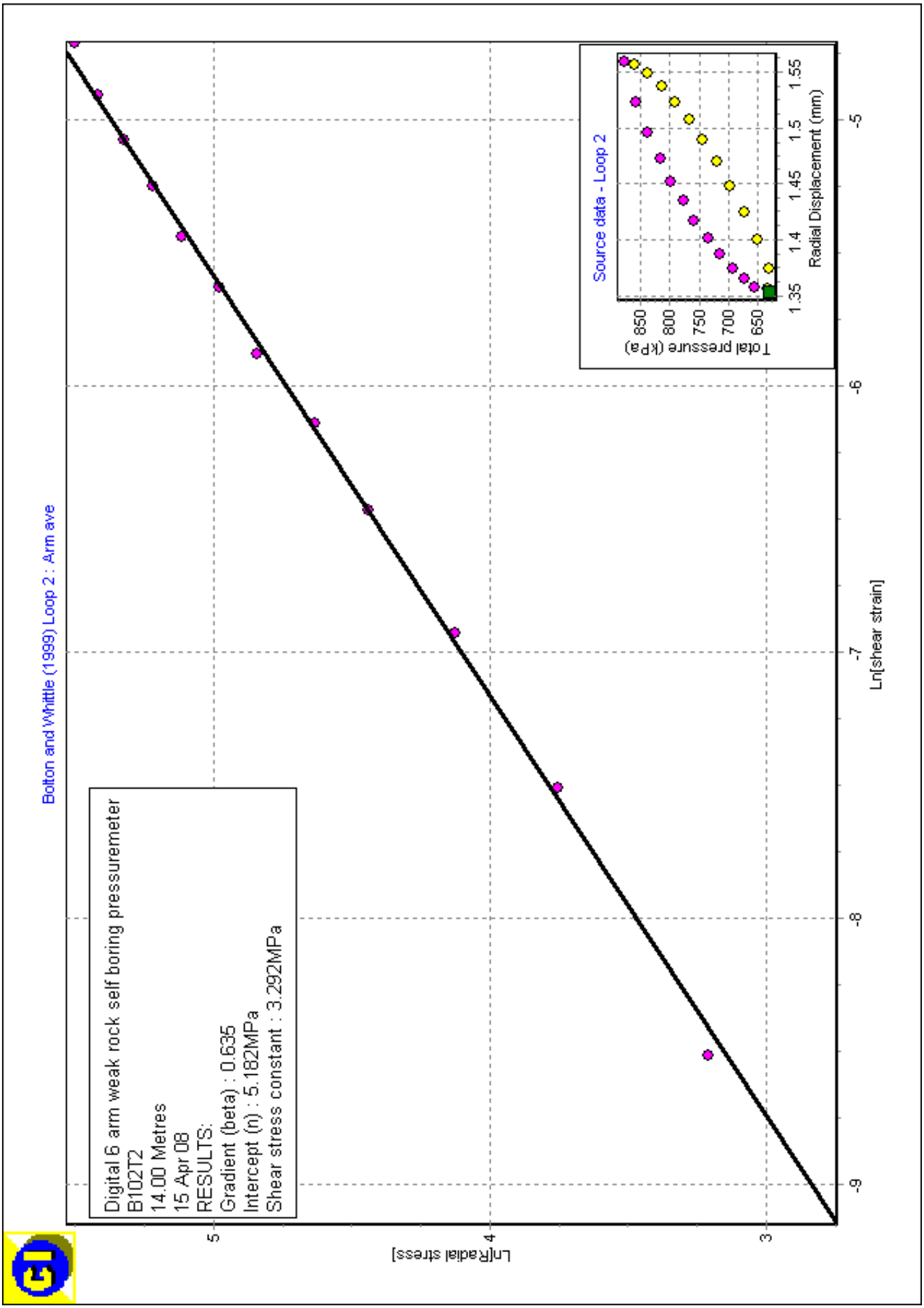

Palmer 1972 (expansion) : Arm ave
RESULTS:
Cu : 133.4kPa
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Shear stress (kPa)
Shear strain (%)

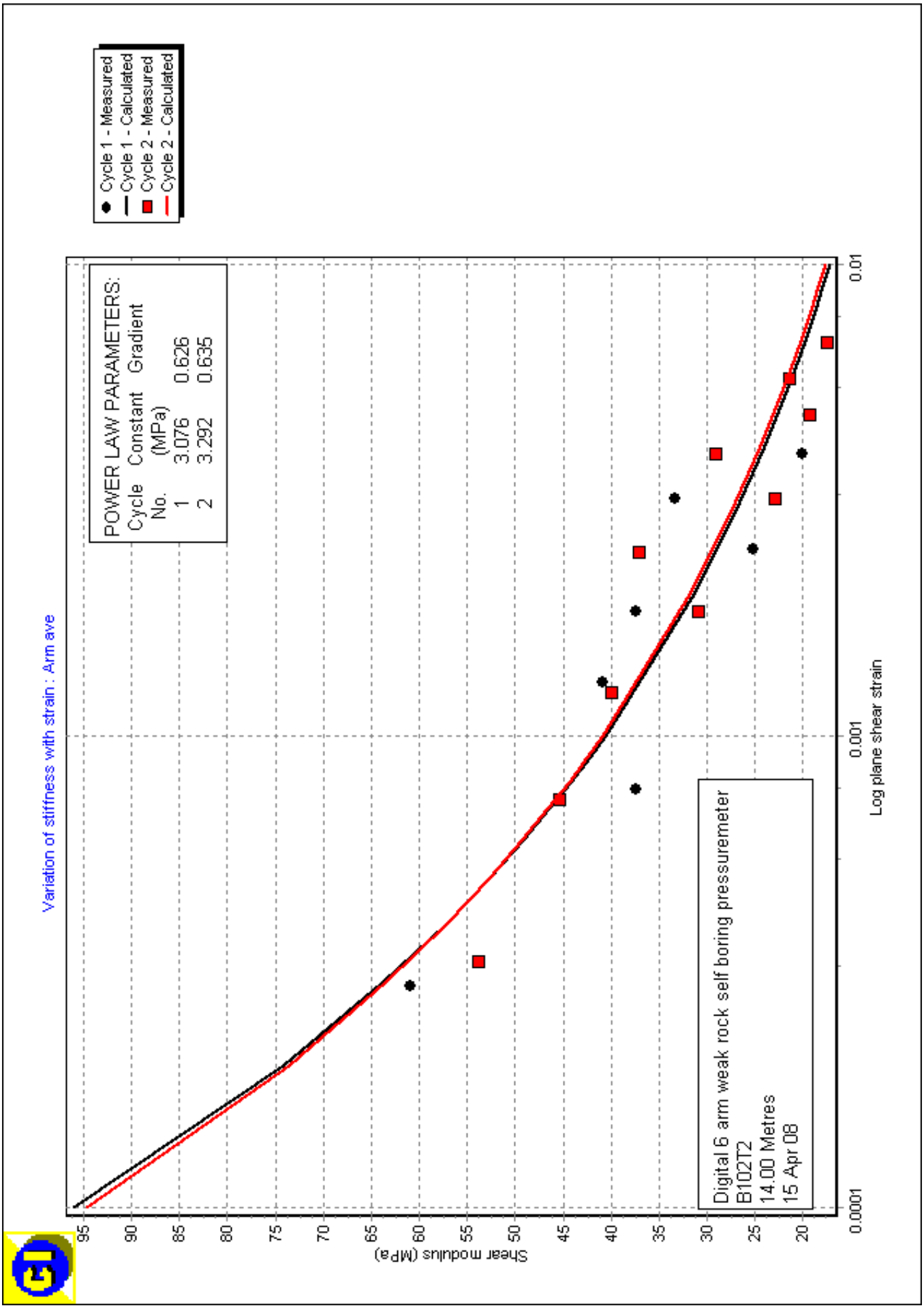

Palmer 1972 (contraction) : Arm ave
RESULTS:
2Cu : 272.6kPa
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Shear stress (kPa)
Shear strain (%)

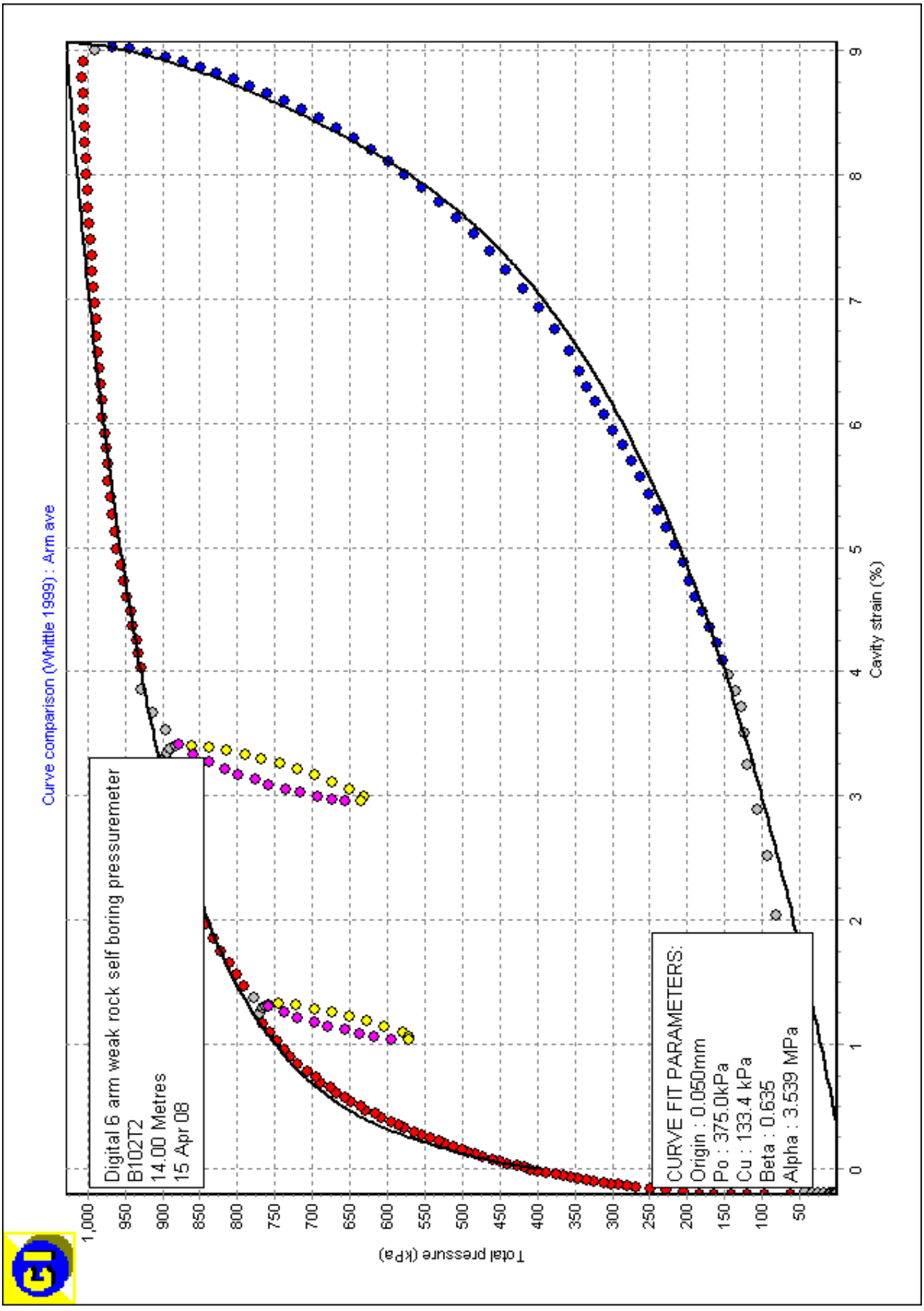

Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 34.2MPa
Cycle mid-point:
Cavity strain : 1.191%
Total stress : 661kPa
Size of cycle :
Shear strain : 0.570%
Total stress : 195kPa
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 27.4MPa
Cycle mid-point:
Cavity strain : 3.200%
Total stress : 756kPa
Size of cycle :
Shear strain : 0.867%
Total stress : 238kPa
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
RESULTS:
Gradient (beta) : 0.626
Intercept (n) : 4.911MPa
Shear stress constant : 3.076MPa
Ln[Radial stress]
Ln[shear strain]
5
4
-8
-7
-6
Source data - Loop 1
Total pressure (kPa)
750
700
650
600
0.55
0.6
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 2 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
RESULTS:
Gradient (beta) : 0.635
Intercept (n) : 5.182MPa
Shear stress constant : 3.292MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)


Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
POWER LAW PARAMETERS:
Cycle No.
Constant (MPa)
Gradient
1 3.076 0.626
2 3.292 0.635
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08


Curve comparison (Whittle 1999) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T2
14.00 Metres
15 Apr 08
CURVE FIT PARAMETERS:
Origin : 0.050mm
Po : 375.0kPa
Cu : 133.4 kPa
Beta : 0.635
Alpha : 3.539 MPa
Total pressure (kPa)
Cavity strain (%)

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
DENMARK PLACE	15/4/08	TUES	B102	2	14.0

Weather:- FINE Material:-

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
?		14:25 – 14:50	1m.	1m/20min	

Ground level :- Orientation:-

Water Press.	Inst.OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
>200kPa	88.1	89.1	73RR	5mm	"Mary"

Drilling Remarks:-

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
1%/min	4(L)	65sec	3000psi	10.2V	TRIAX	10MPa.

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-117	89	-55	41	-91	128	-1073	-917	-2464	Ground Level Zeros
									Pre-drilling Zeros
									Post-drilling Zeros
-126	93	-60	35	-103	107	-1033	-861	-2459	Pre-test Zeros
									Ground Level Zeros

Test starts:- 14:52

Line	Notes
332	Hold
337	Loop 1 Ret
372	Hold 900kPa
376	Loop 2
405	PP3
443	Unload

Test ends:- 15:17. Max Press:- 1027kPa.

Calibrated Data details:

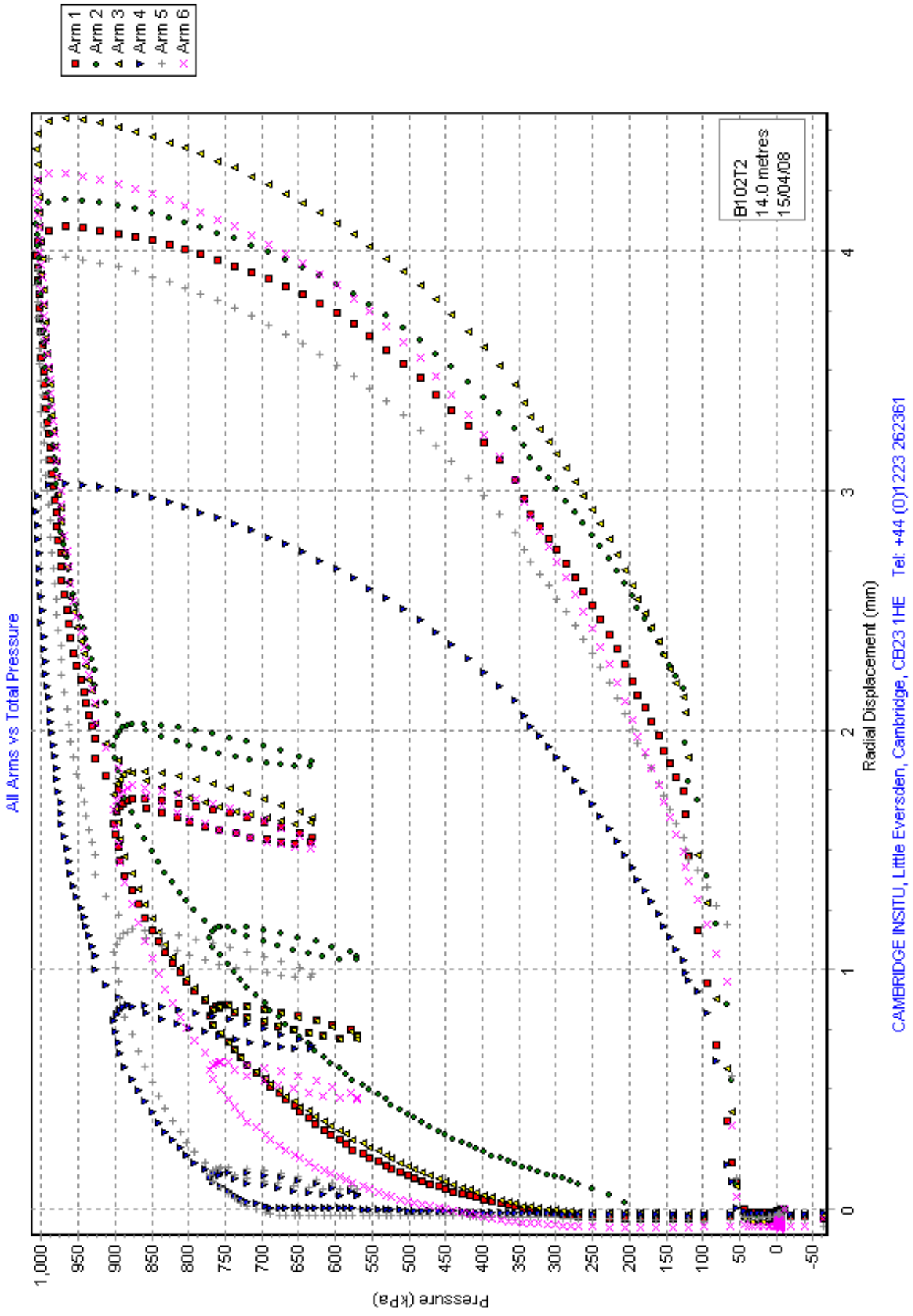
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
W01307	W01307	10/4/08	9/4/08.

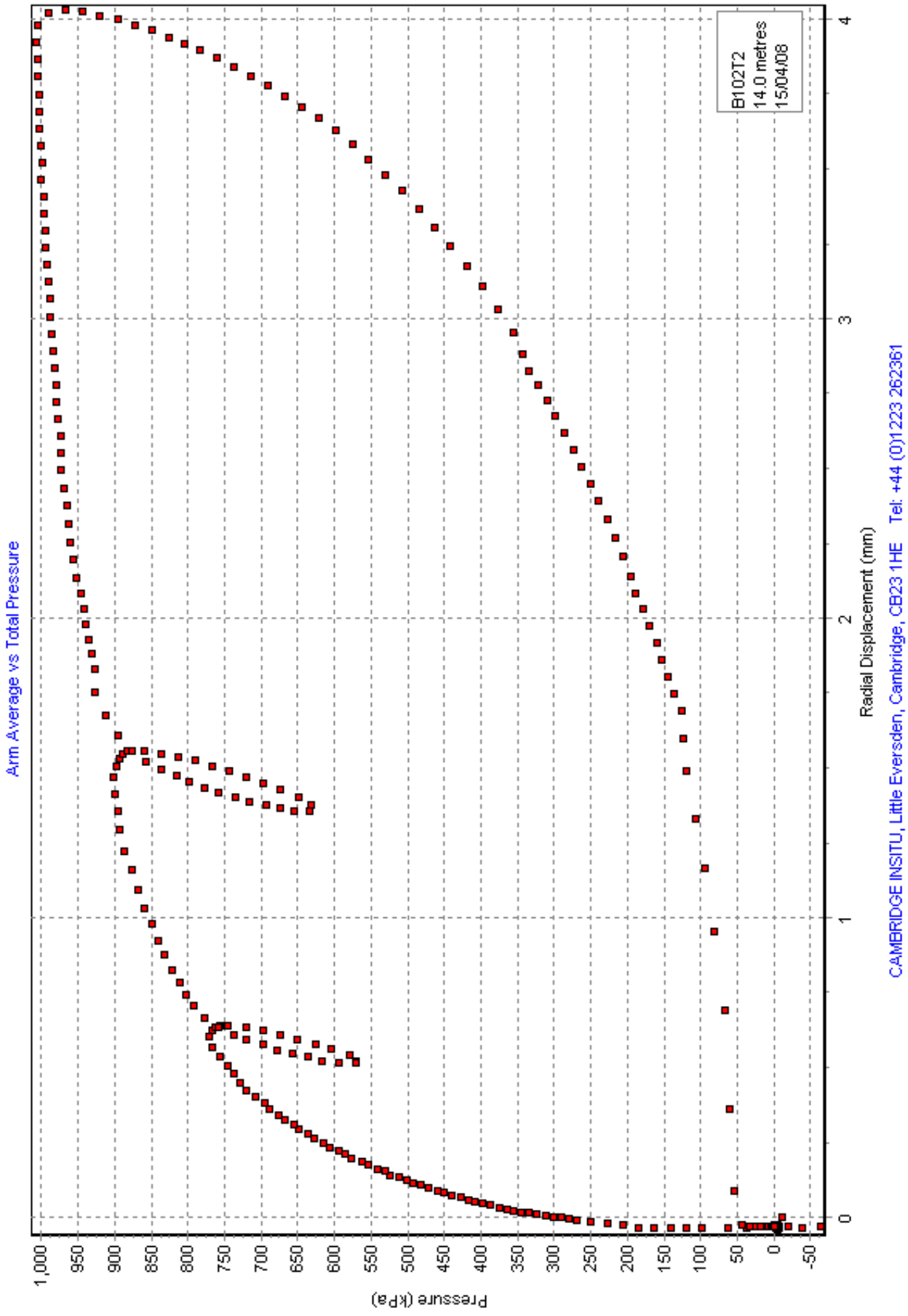
TEST REMARKS:

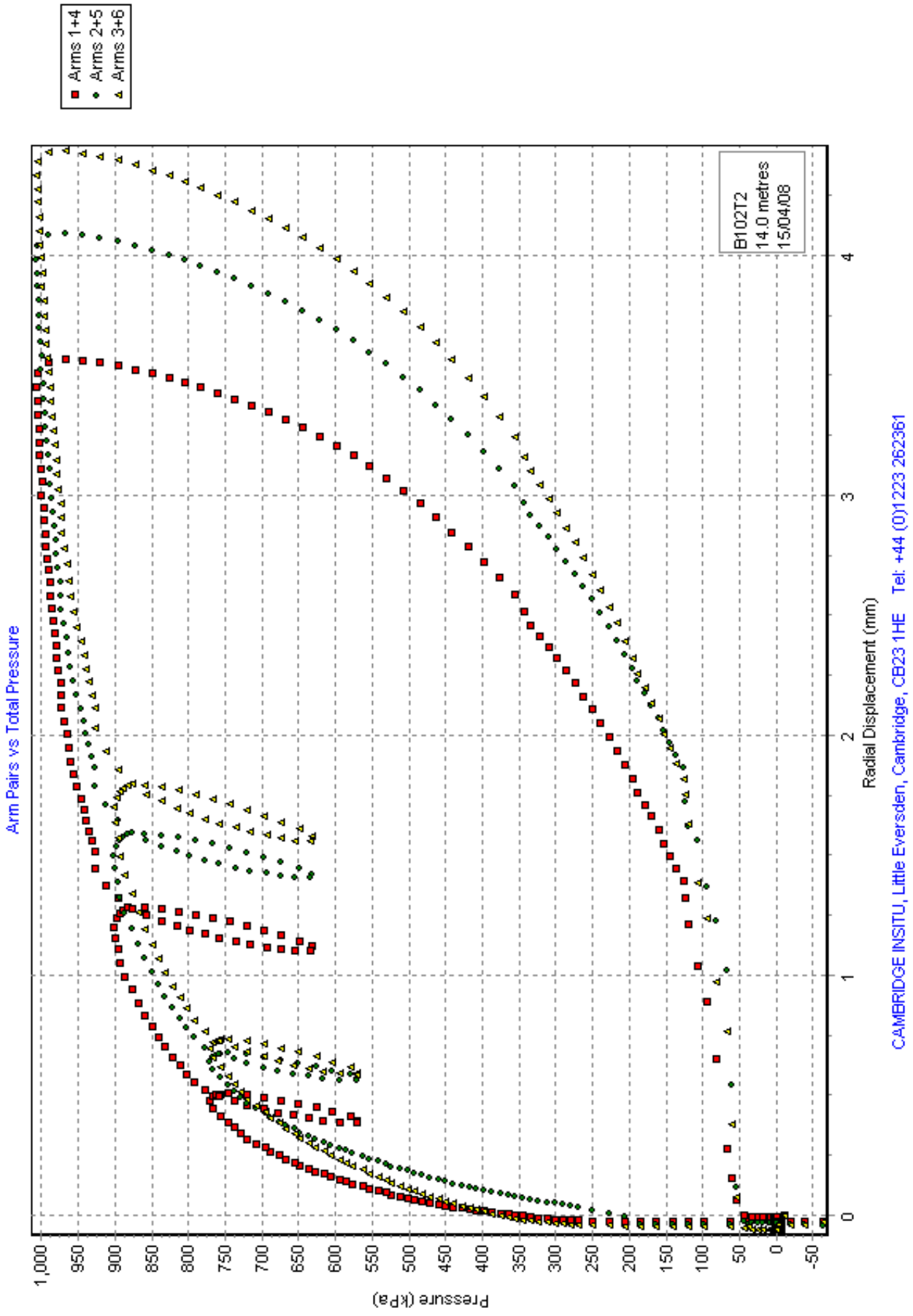
Driller: DAN

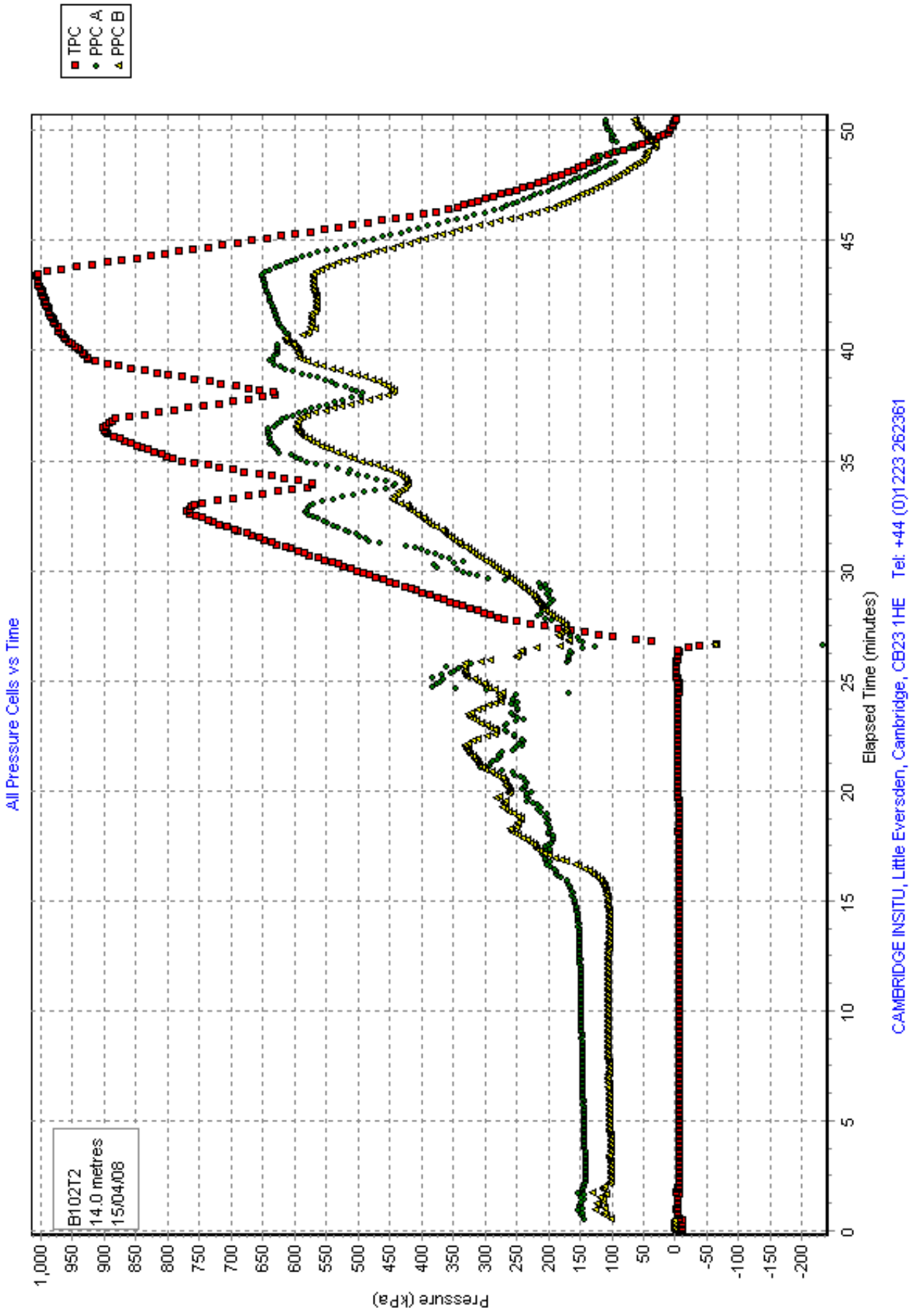
Tester: RW

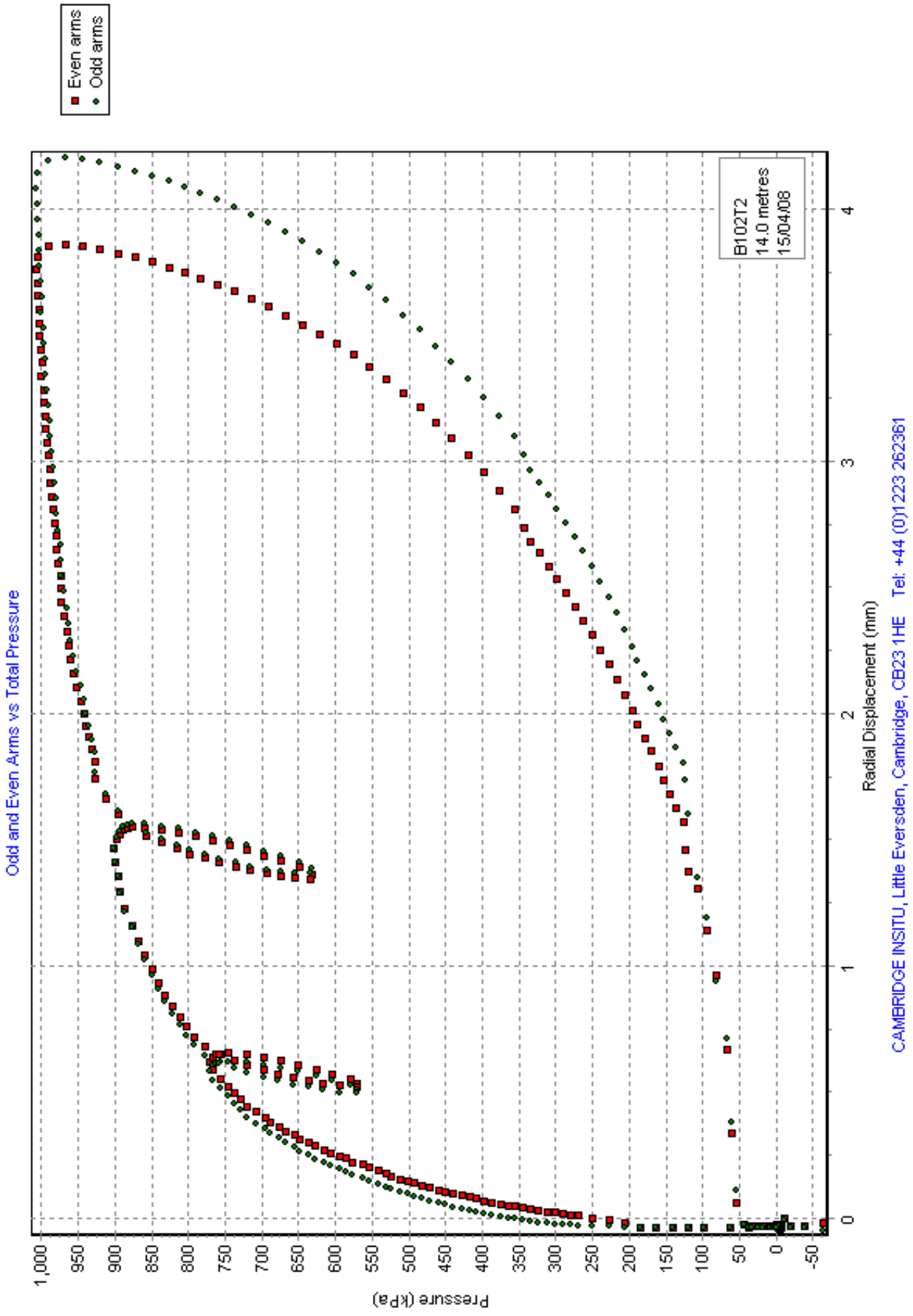
CAMBRIDGE INSITU, Little Eversden, Cambridge CB3 7HE Tel: (01223) 262 361 Fax: (01223) 263 947
SBP6TRS.DOC May 25th, 2001 E-mail: CamInsitu@AOL.com Web site: Cambridge-Insitu.com


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
All Arms vs Total Pressure
B102T2
14.0 metres
15/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
B102T2
14.0 metres
15/04/08
Pressure (kPa)
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
Radial Displacement (mm)
0
1
2
3
4
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arms 1+4
Arms 2+5
Arms 3+6
Arm Pairs vs Total Pressure
Pressure (kPa)
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
-50
Radial Displacement (mm)
0
1
2
3
4
B102T2
14.0 metres
15/04/08
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


TPC
PPC A
PPC B
B102T2
14.0 metres
15/04/08
All Pressure Cells vs Time
Pressure (kPa)
Elapsed Time (minutes)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T2
14.0 metres
15/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361

B102T3 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]
Project : 36237
Site : Denmark Place
Borehole : BH102
Test name : B102T3
Test date : 16 Apr 08
Test depth : 20.00 Metres
Water table : 5.6 Metres
Ambient PWP : 141.3 kPa
Material : London Clay
Probe : Digital 6 arm weak rock self boring pressuremeter
Diameter : 88.1 mm
Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out
The file includes results from a curve fitting analysis

Analysed by RWW on 16 Apr 08

Remarks:

[RESULTS FOR CAVITY REFERENCE PRESSURE]
Strain Origin (mm) : "Arm ave=0.079"
Po from Marsland & Randolph (kPa) : "Arm ave=607.2"
Po from Lift off (kPa) : "Arm ave=430.2"
PWP versus Total Stress (kPa) : "PPC Ave=236.2"
Best estimate of Po (kPa) : "Arm ave=607.0"

[UNDRAINED STRENGTH PARAMETERS]
Gibson & Anderson 1961 - Cu (kPa) : "Arm ave=297.2"
Limit pressure (kPa) : "Arm ave=2380"
Jefferies 1988 - Cu (kPa) : "Arm ave=321.8"
Undrained yield stress (kPa) : "Arm ave=862.3"

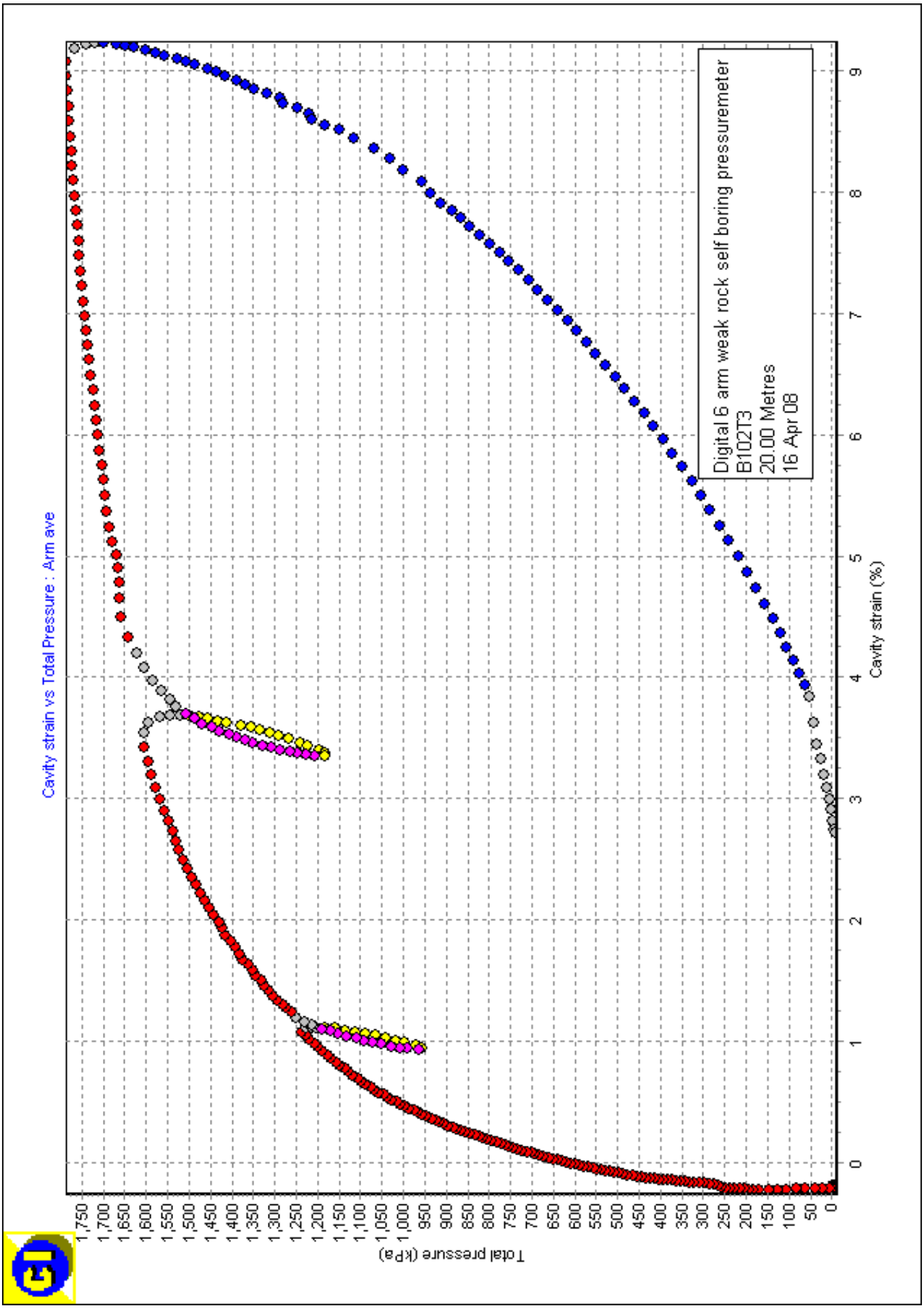
[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=47.7"

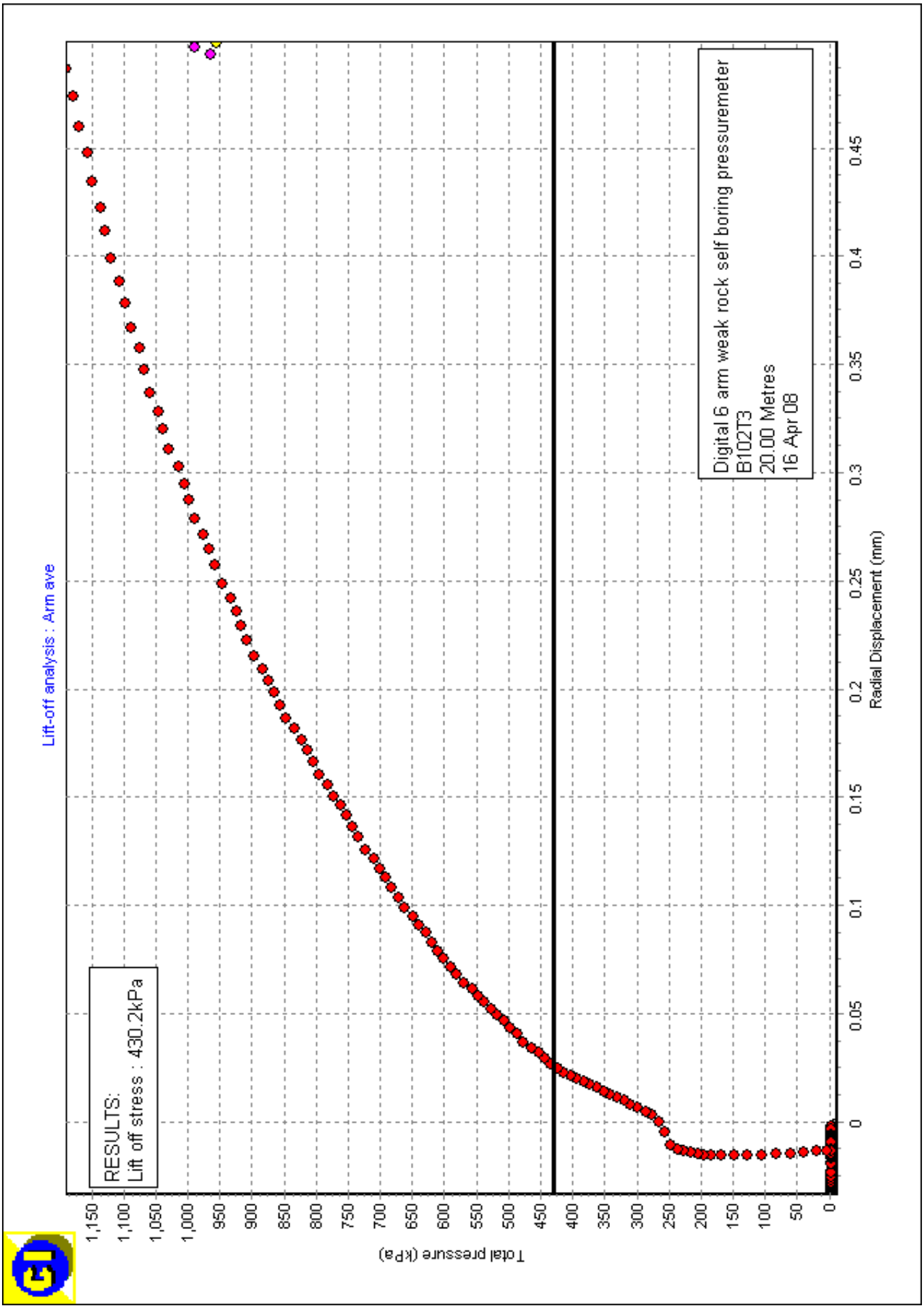
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	65.5	1.034	1077	0.369	242
Arm ave	2	49.0	3.533	1344	0.655	322

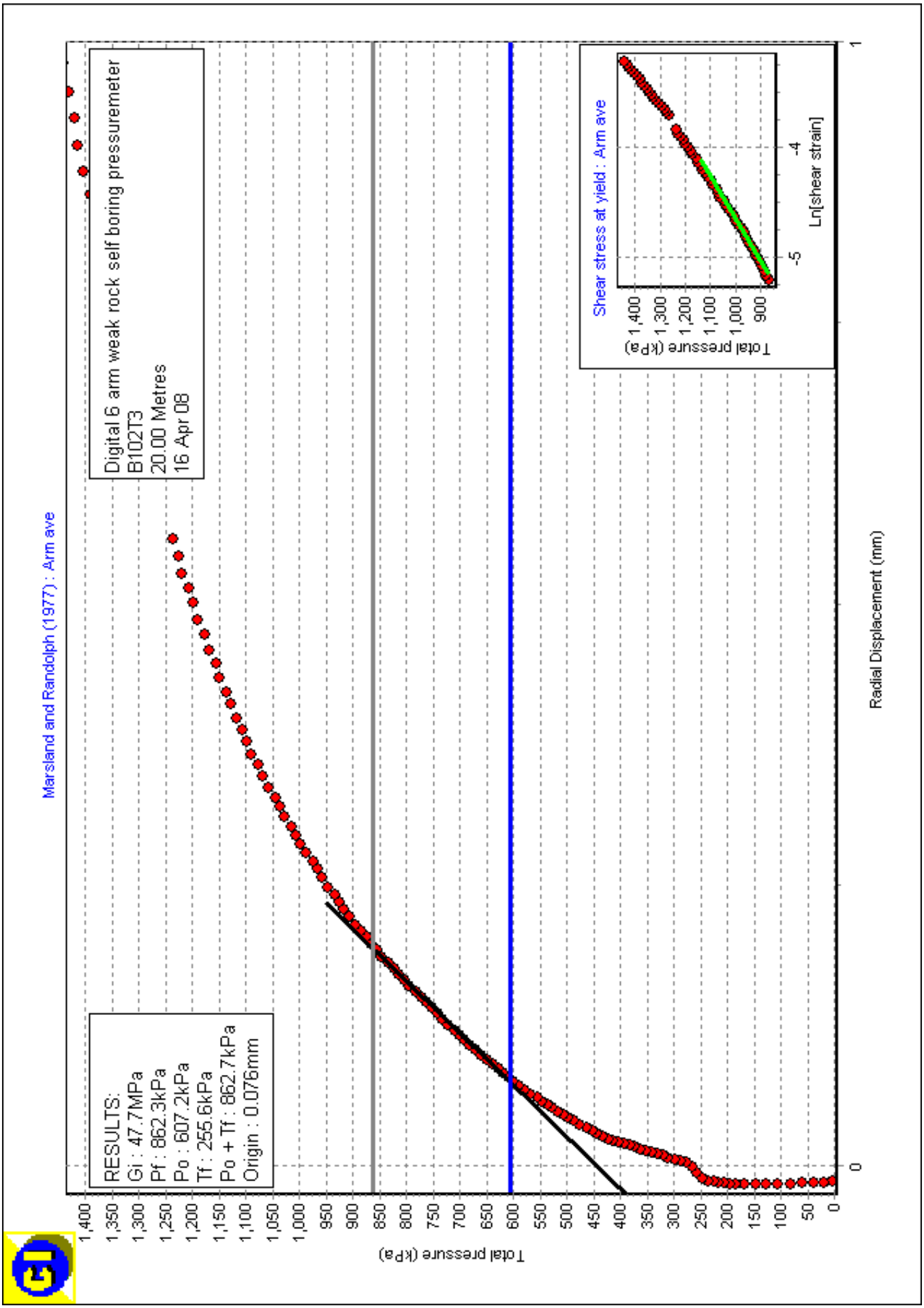
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

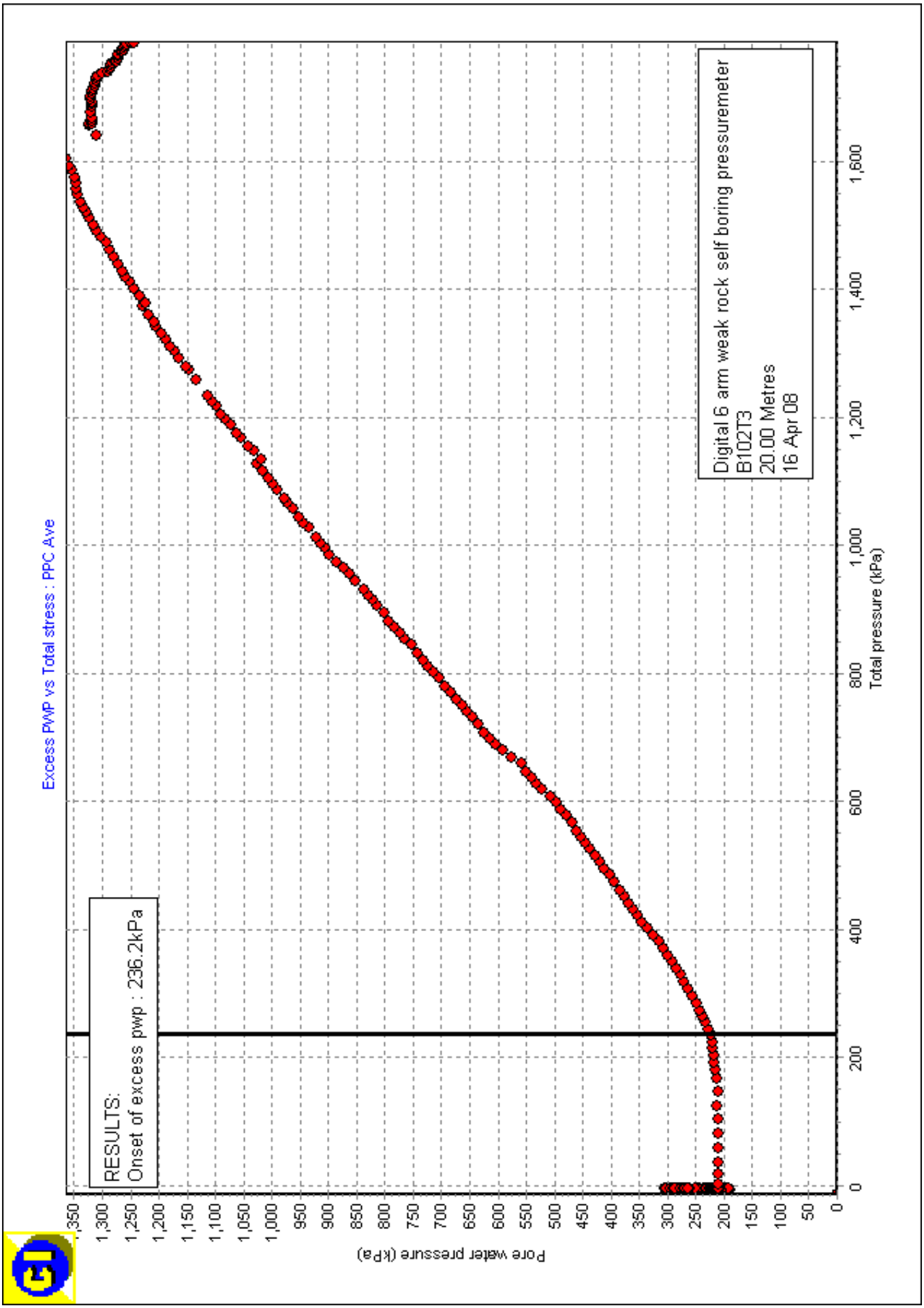
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	11.060	7.481	0.676
Arm ave	2	8.449	5.405	0.640

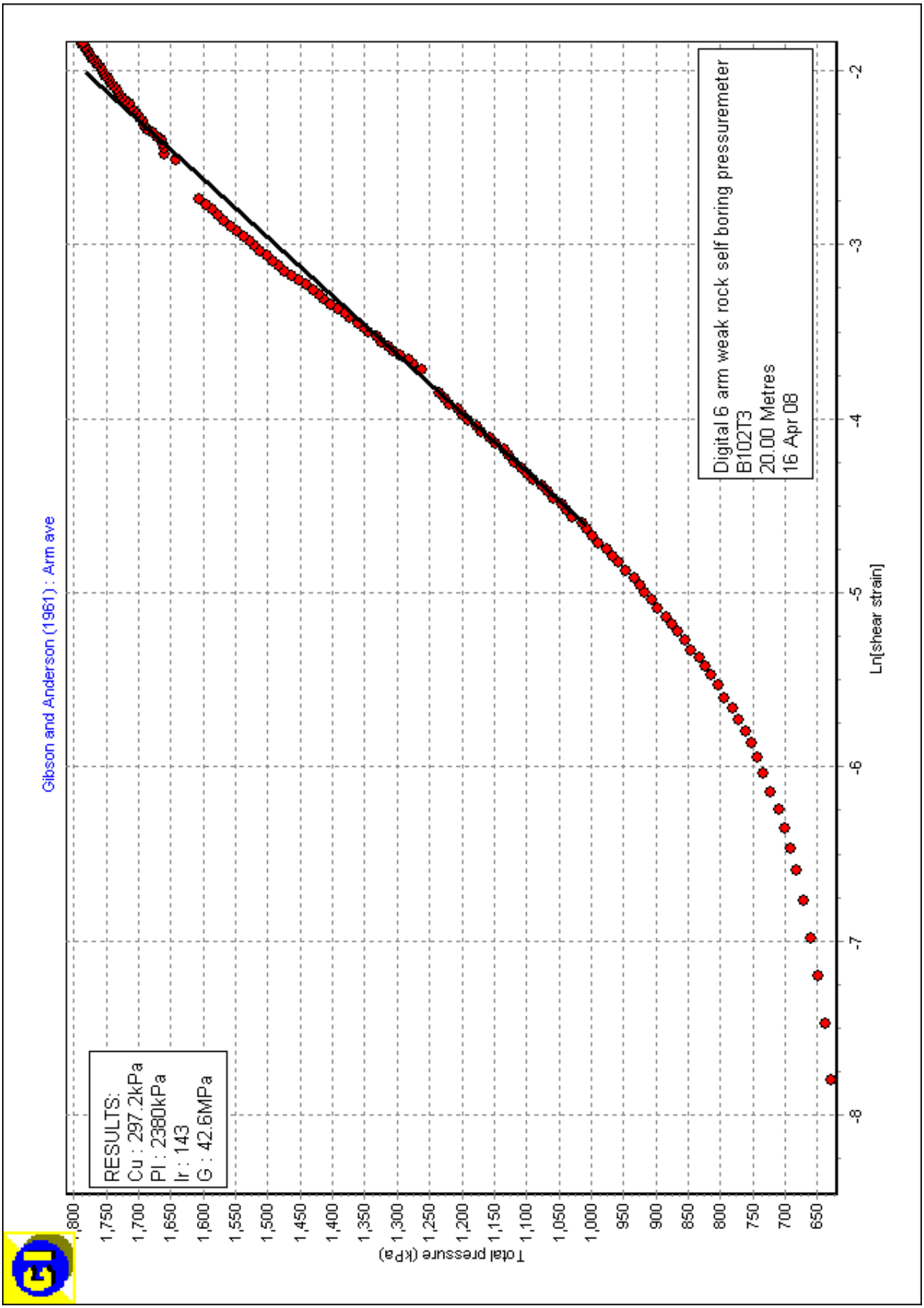
[PARAMETERS USED FOR UNDRAINED CURVE MODELLING]
Axis is Arm ave
Strain Origin (mm) : 0.04
Po (kPa) : 487
Cu (kPa) : 320.6
Limit pressure (kPa) : 2448
Non-linear exponent : 0.676
Calculated alpha (MPa) : 7.374
G at yield (MPa) : 33.1

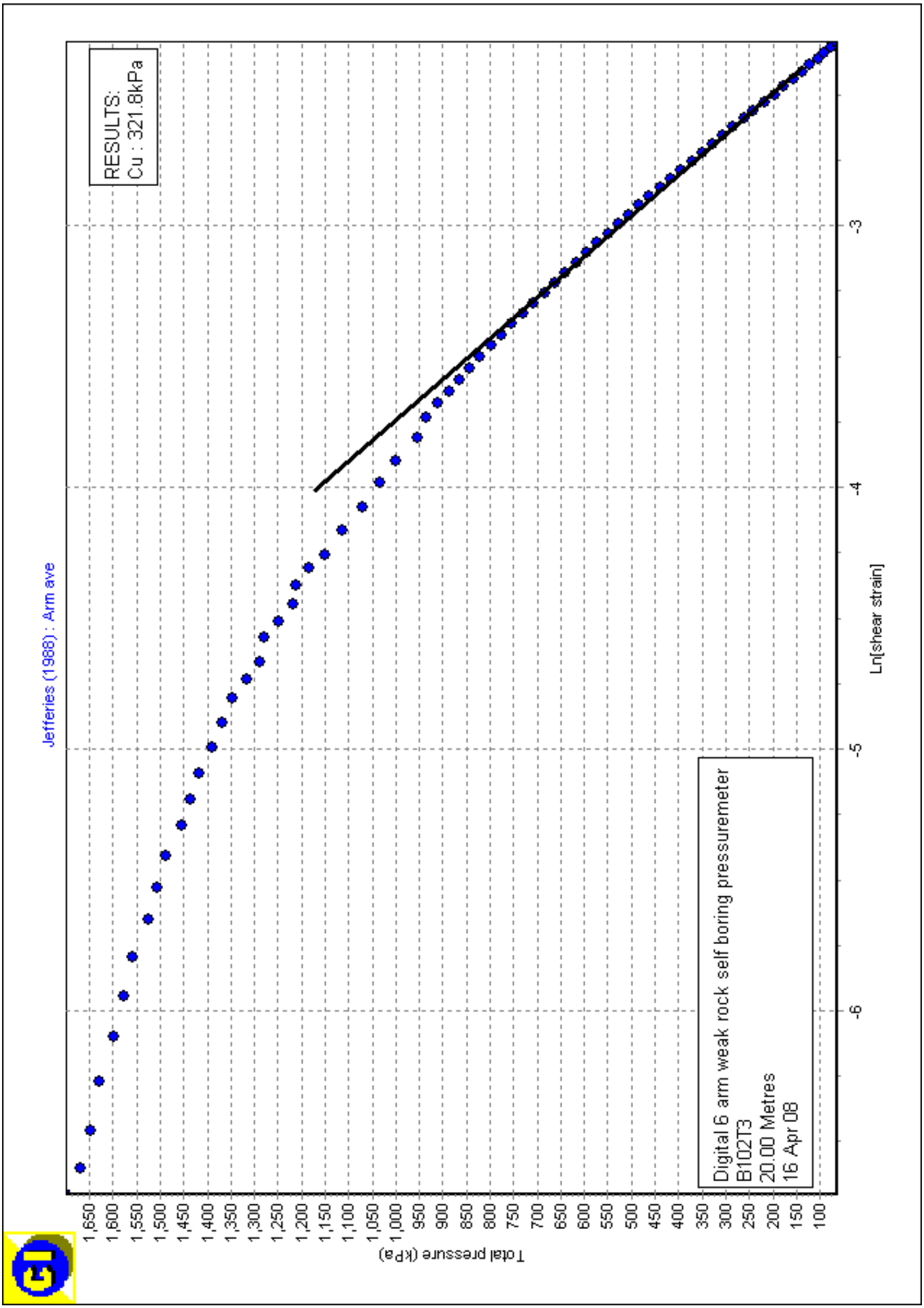

Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Total pressure (kPa)
Cavity strain (%)


Lift-off analysis : Arm ave
RESULTS:
Lift off stress : 430.2kPa
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Total pressure (kPa)
Radial Displacement (mm)
1,150
1,100
1,050
1,000
950
900
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45


Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
RESULTS:
Gi : 47.7MPa
Pf : 862.3kPa
Po : 607.2kPa
Tf : 255.6kPa
Po + Tf : 862.7kPa
Origin : 0.076mm
Marsland and Randolph (1977) : Arm ave
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]


Excess PWP vs Total stress : PPC Ave
RESULTS:
Onset of excess pwp : 236.2kPa
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Pore water pressure (kPa)
Total pressure (kPa)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1,000
1,050
1,100
1,150
1,200
1,250
1,300
1,350
0
200
400
600
800
1,000
1,200
1,400
1,600


Gibson and Anderson (1961) : Arm ave
RESULTS:
Cu : 297.2kPa
PI : 2380kPa
Ir : 143
G : 42.6MPa
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Total pressure (kPa)
Ln[shear strain]


RESULTS:
Cu : 321.8kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Total pressure (kPa)
Ln[shear strain]
1,650
1,600
1,550
1,500
1,450
1,400
1,350
1,300
1,250
1,200
1,150
1,100
1,050
1,000
950
900
850
800
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550
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350
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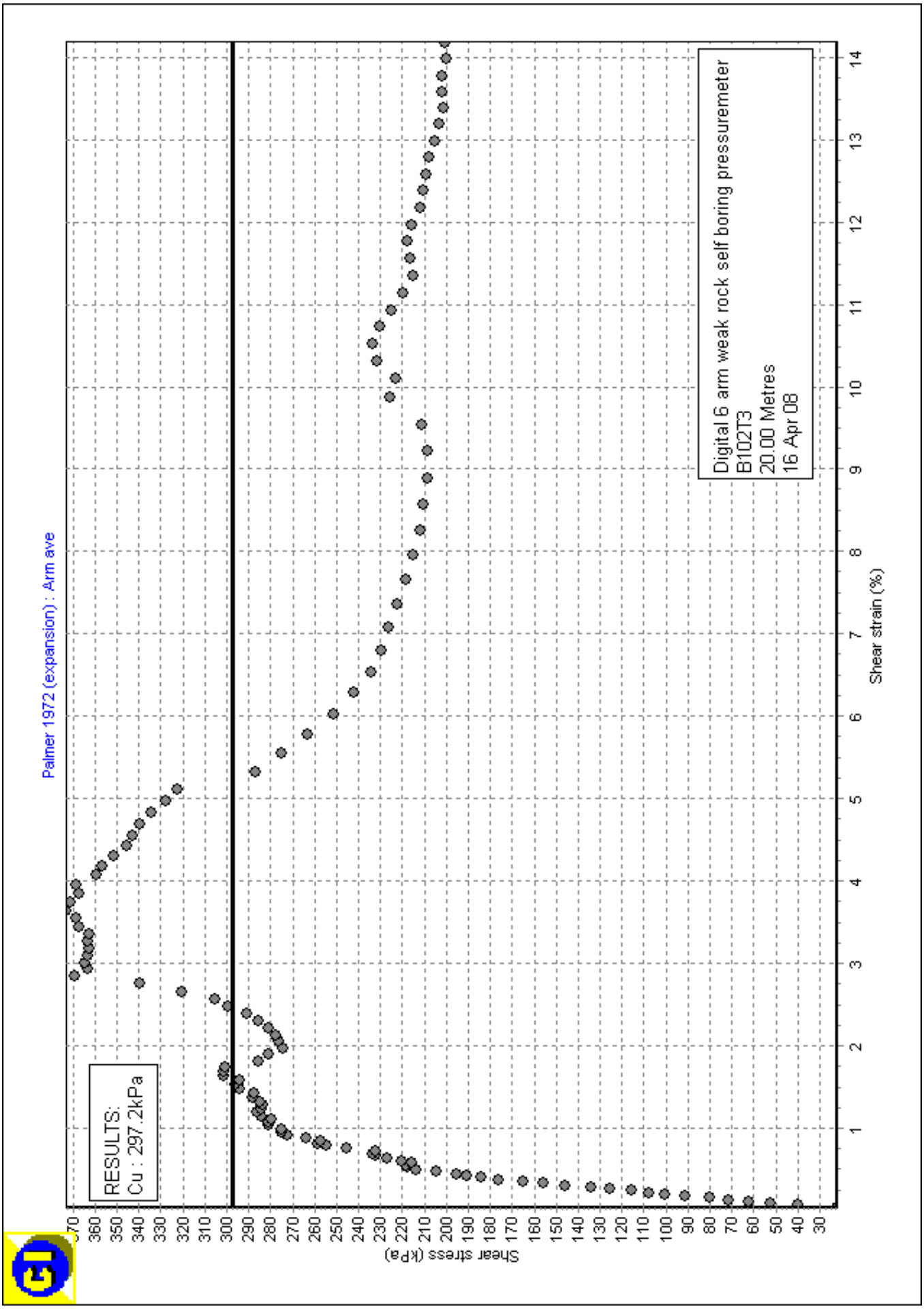
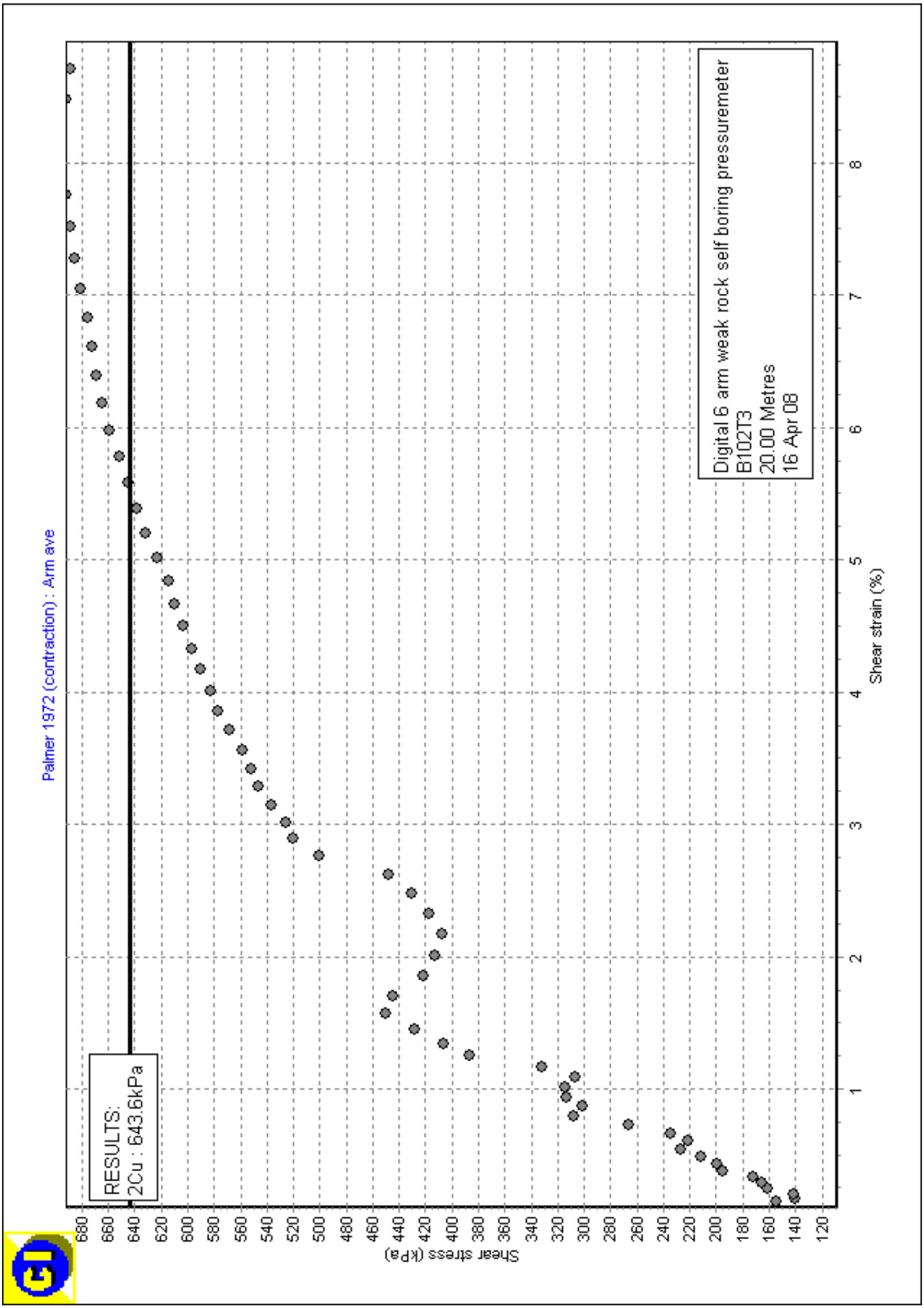
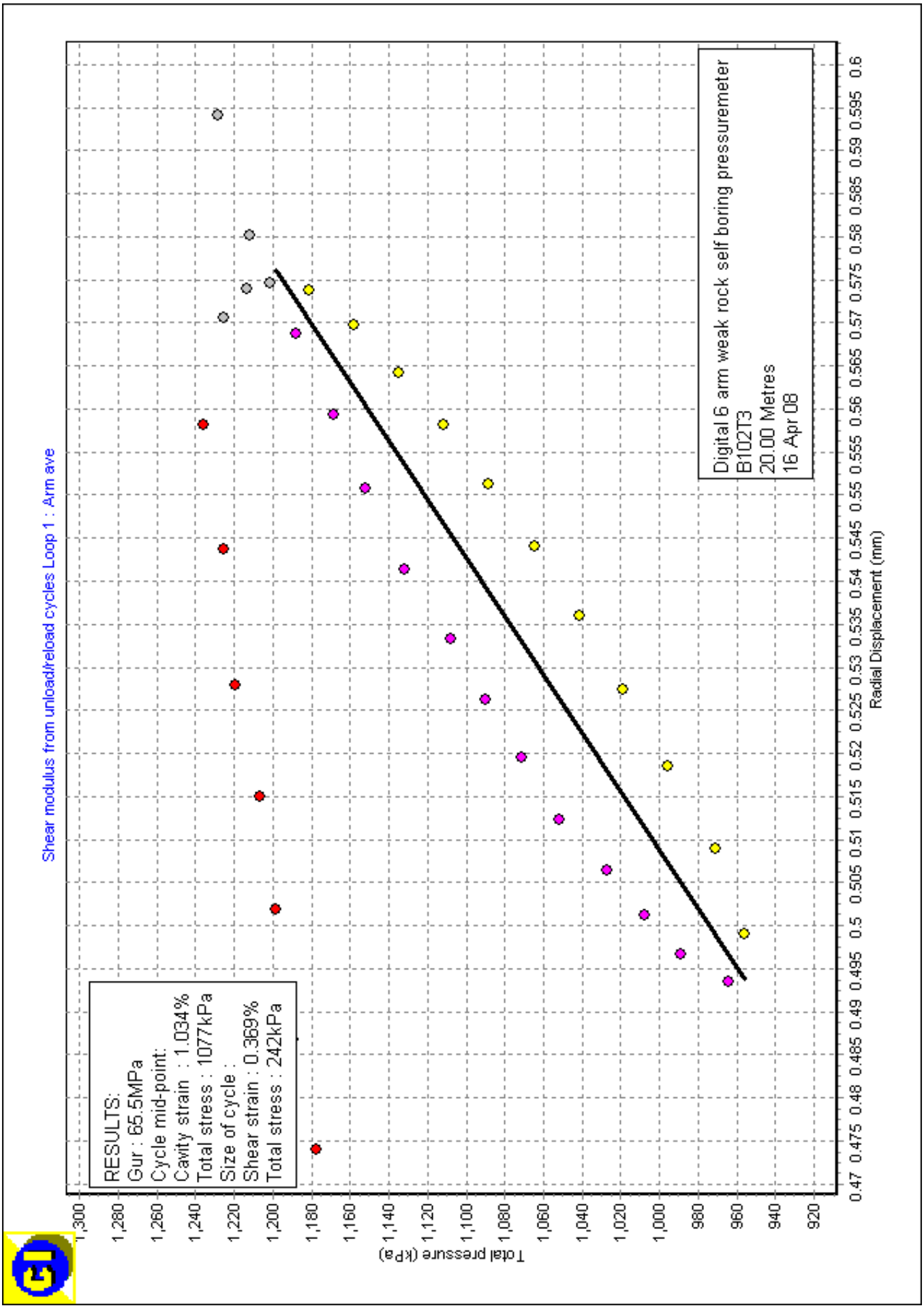
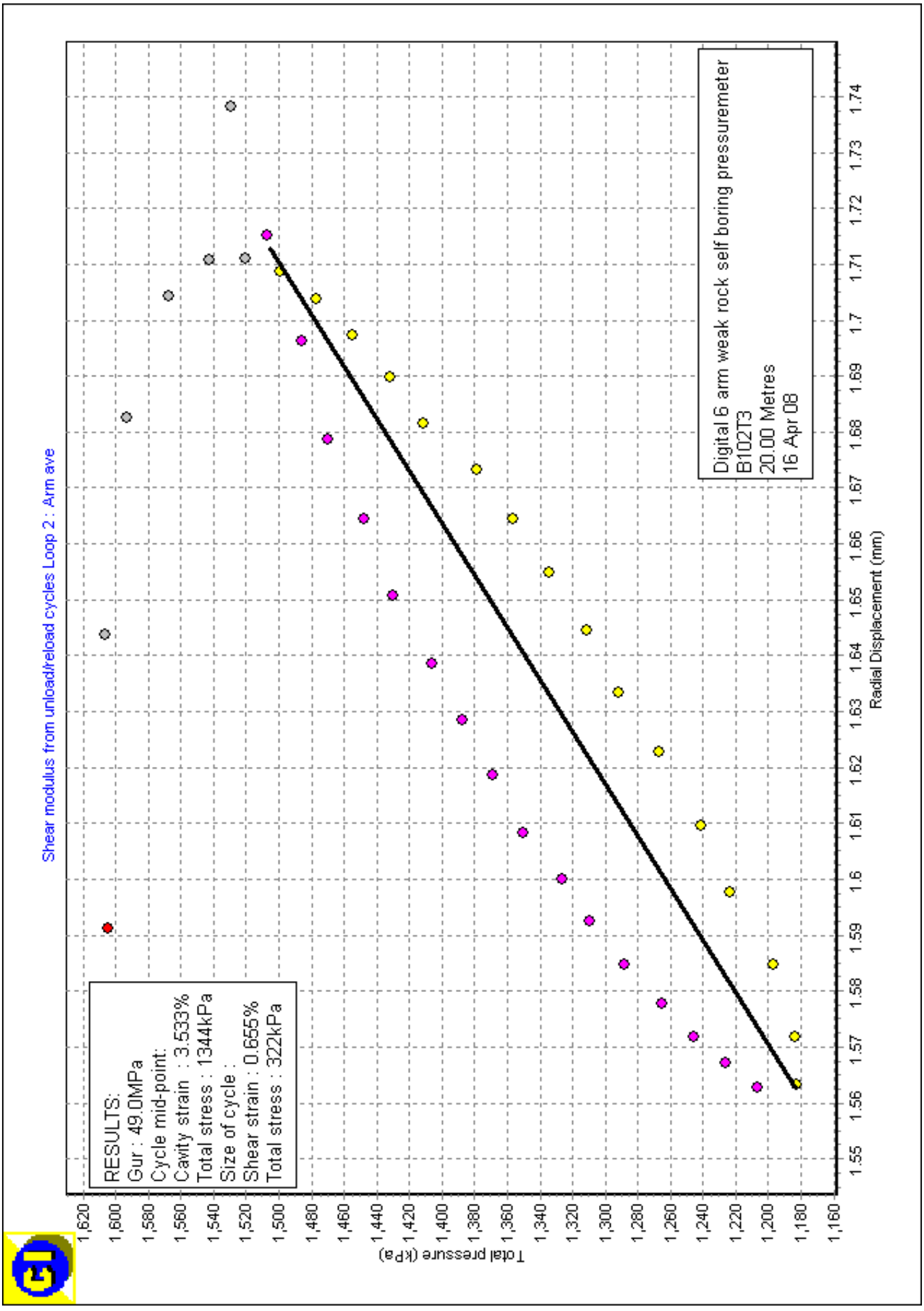
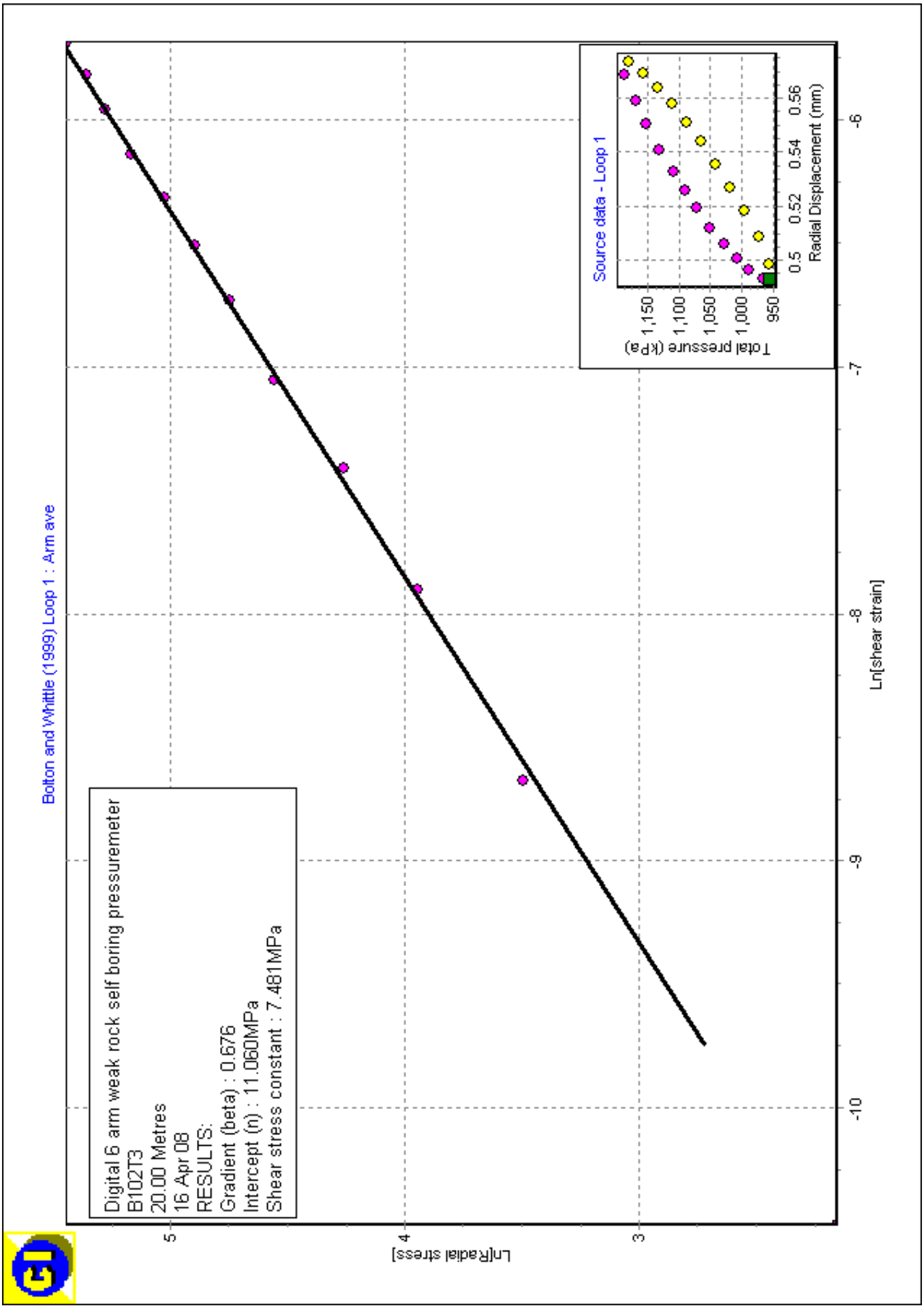
150
100
-3
-4
-5
-6

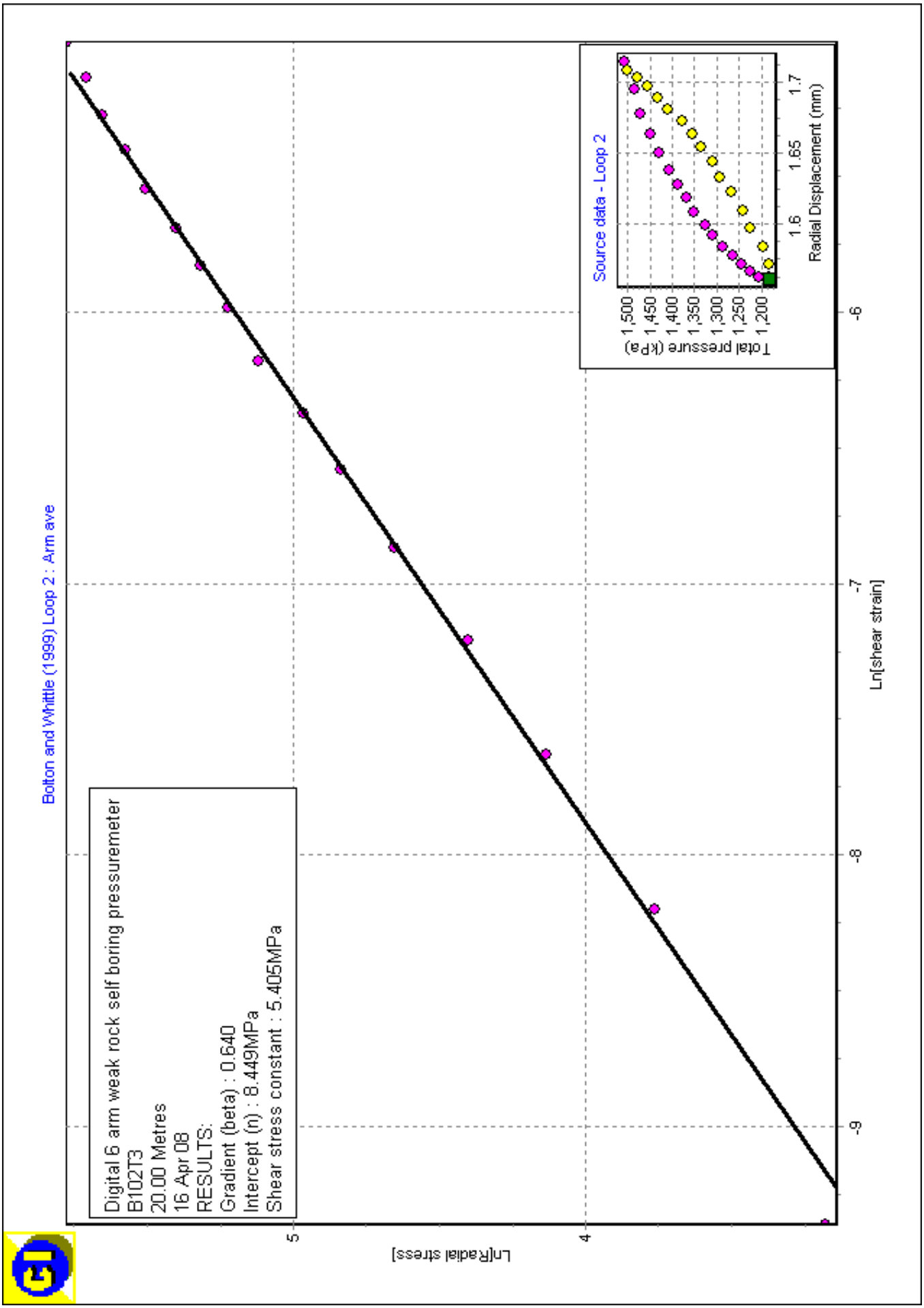

Palmer 1972 (expansion) : Arm ave
RESULTS:
Cu : 297.2kPa
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Shear stress (kPa)
Shear strain (%)

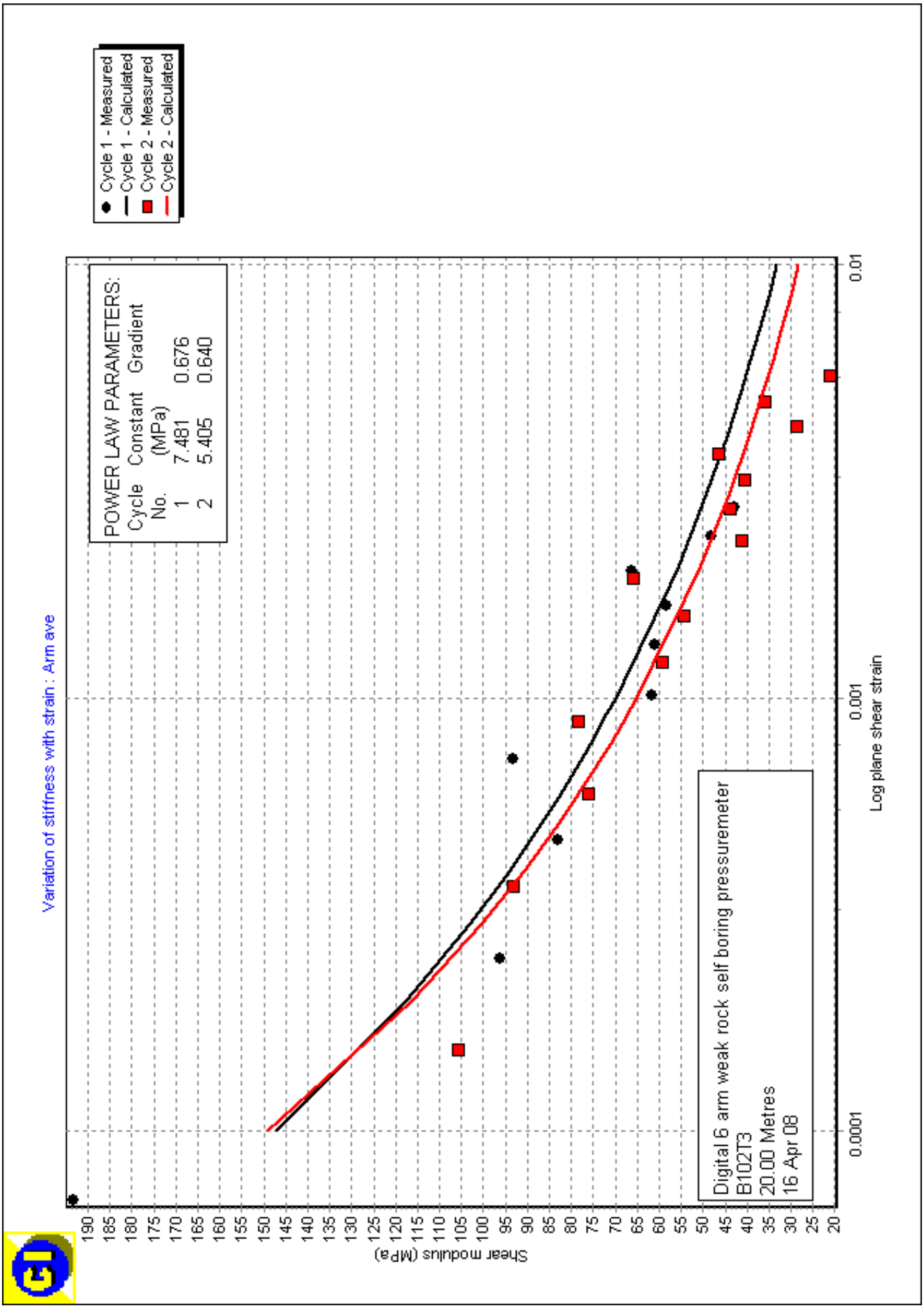

Palmer 1972 (contraction) : Arm ave
RESULTS:
2Cu : 643.6kPa
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Shear stress (kPa)
Shear strain (%)

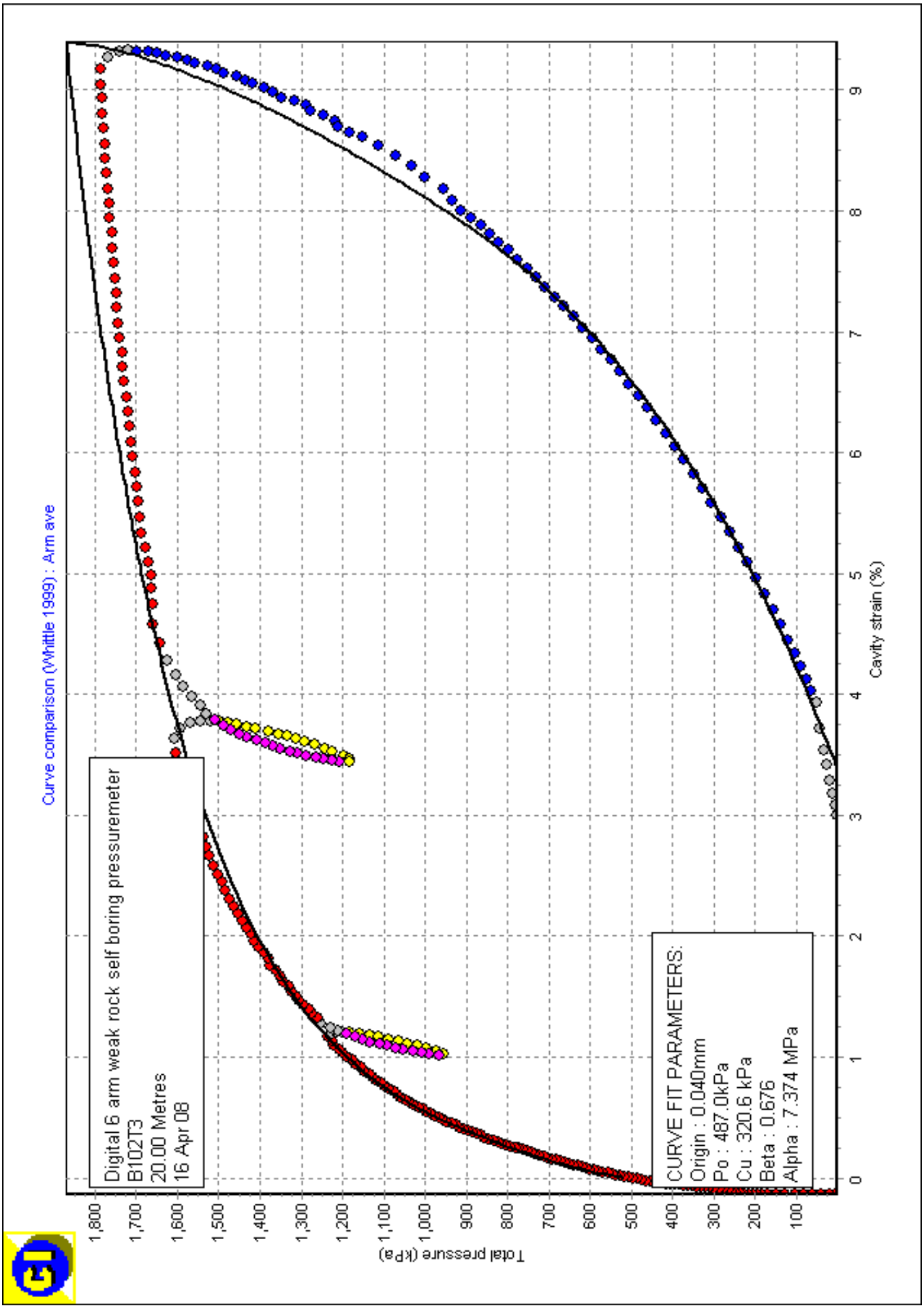

Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 65.5MPa
Cycle mid-point:
Cavity strain : 1.034%
Total stress : 1077kPa
Size of cycle :
Shear strain : 0.369%
Total stress : 242kPa
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 49.0MPa
Cycle mid-point:
Cavity strain : 3.533%
Total stress : 1344kPa
Size of cycle :
Shear strain : 0.655%
Total stress : 322kPa
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
RESULTS:
Gradient (beta) : 0.676
Intercept (n) : 11.060MPa
Shear stress constant : 7.481MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 1
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 2 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
RESULTS:
Gradient (beta) : 0.640
Intercept (n) : 8.449MPa
Shear stress constant : 5.405MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)


Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
POWER LAW PARAMETERS:
Cycle No. Constant (MPa) Gradient
1 7.481 0.676
2 5.405 0.640
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
0.0001
0.001
0.01
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08


Curve comparison (Whittle 1999) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T3
20.00 Metres
16 Apr 08
CURVE FIT PARAMETERS:
Origin : 0.040mm
Po : 487.0kPa
Cu : 320.6 kPa
Beta : 0.676
Alpha : 7.374 MPa
Total pressure (kPa)
Cavity strain (%)

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
DENMARK PLACE	16/4/08	WED	102	3	20.0

Weather:- F.NS Material:- LONDON CLAY.

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
	09:40	10:10	1M	1M/30M.N	80 BARS

Ground level :- Orientation:-

Water Press.	Inst.OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
>200K.	88.1	89.1	73 EE	5MM	'MUCH'

Drilling Remarks:-

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
1%/MIN	4(L)	60SEC	200 BAR	12.56	TRIAX	10MPa.

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-113	91	-60	36	-88	130	-1036	-923	-2459	Ground Level Zeros
									Pre-drilling Zeros
-125	92	-35	36	-102	106	-982	-878	-2452	Post-drilling Zeros
									Pre-test Zeros
									Ground Level Zeros

Test starts:- 10:10.

Line	Notes
407	1235KPa Load 1. PEJ.
473	Load 2, PEJ.
554	unload. PEJ.

Test ends:- 10:46. Max Press:- 1786 KPa.

Calibrated Data details:

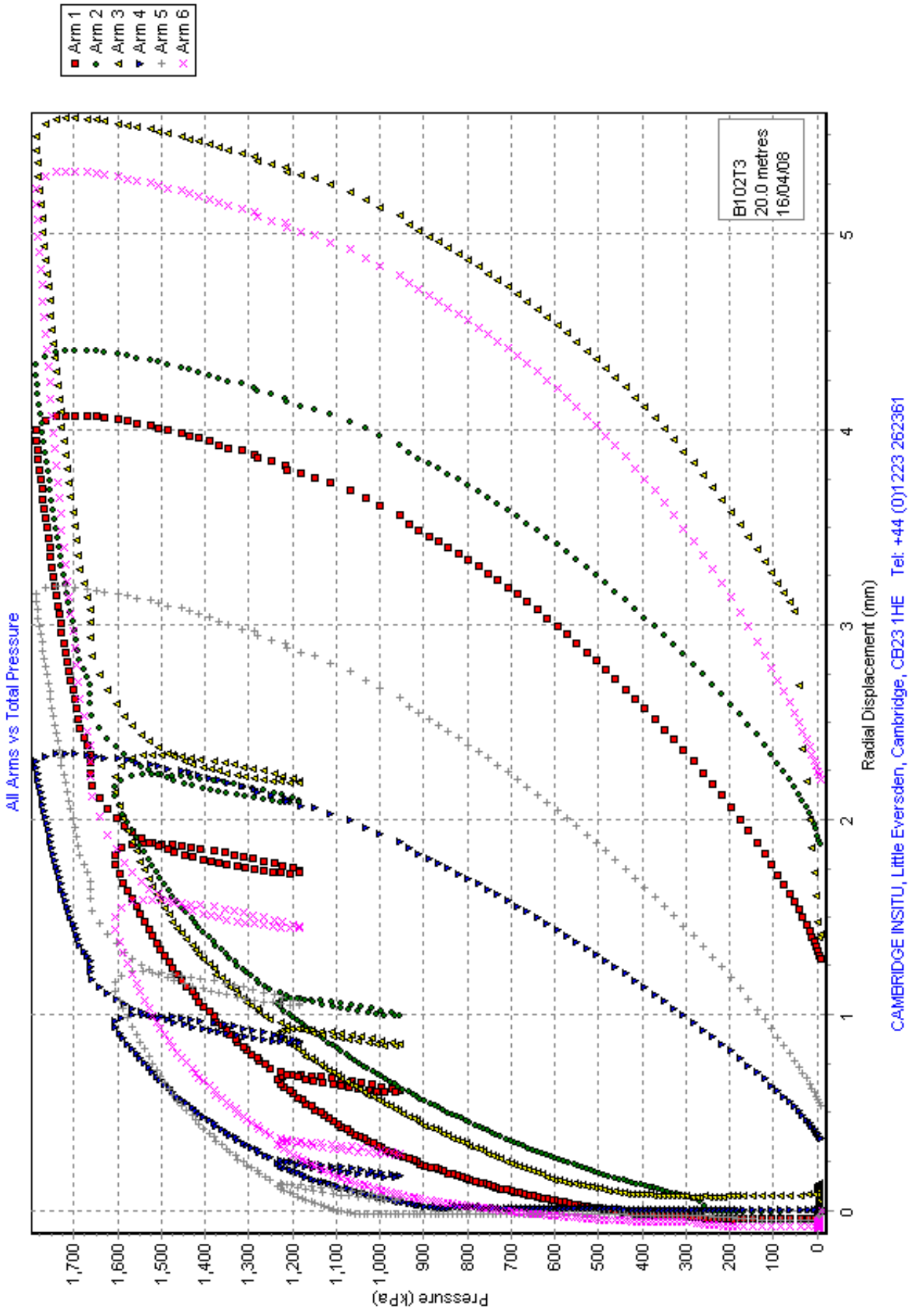
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
W013077	W0730T2	10/4/08	11/4/08

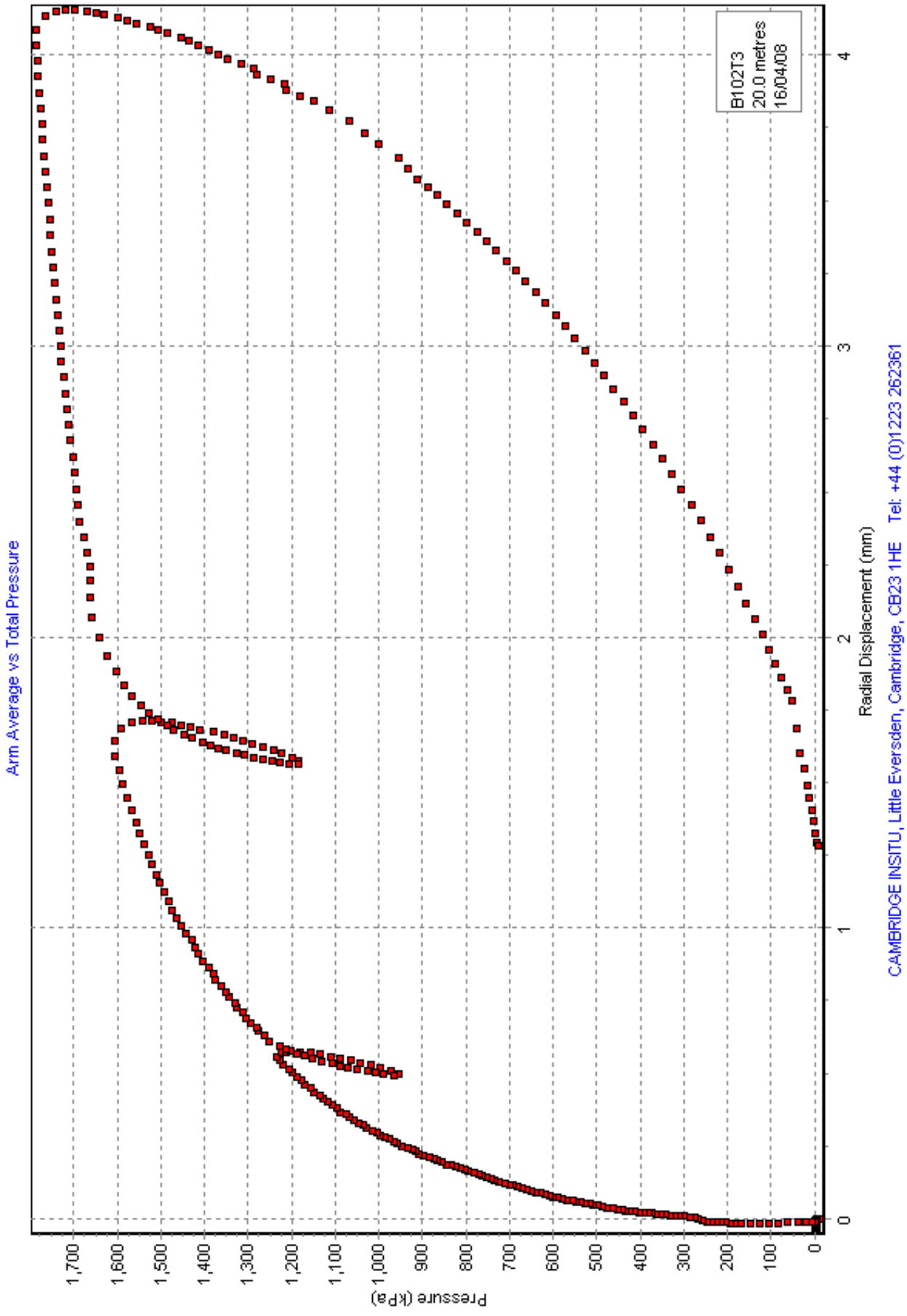
TEST REMARKS:

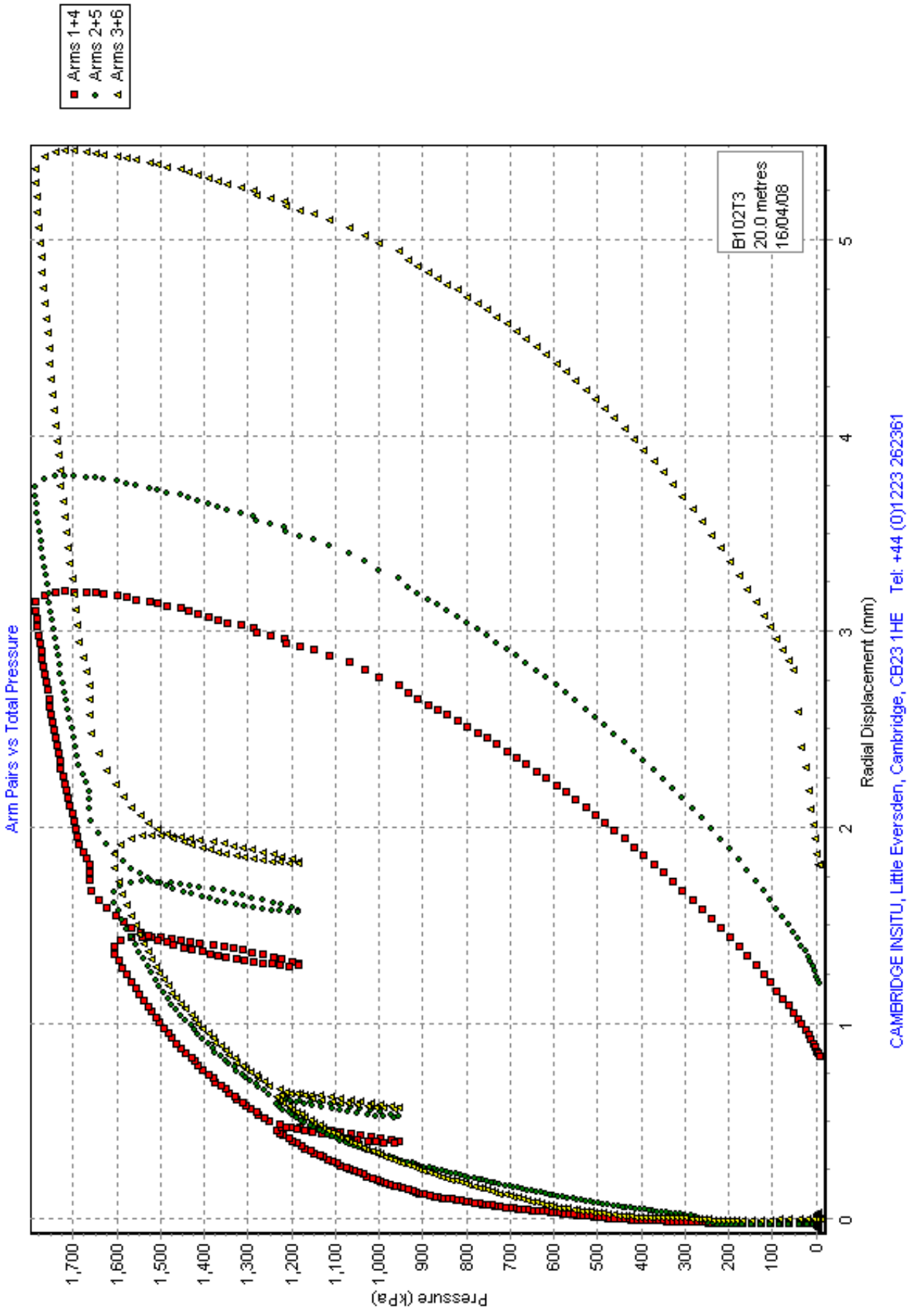
Driller: DAN

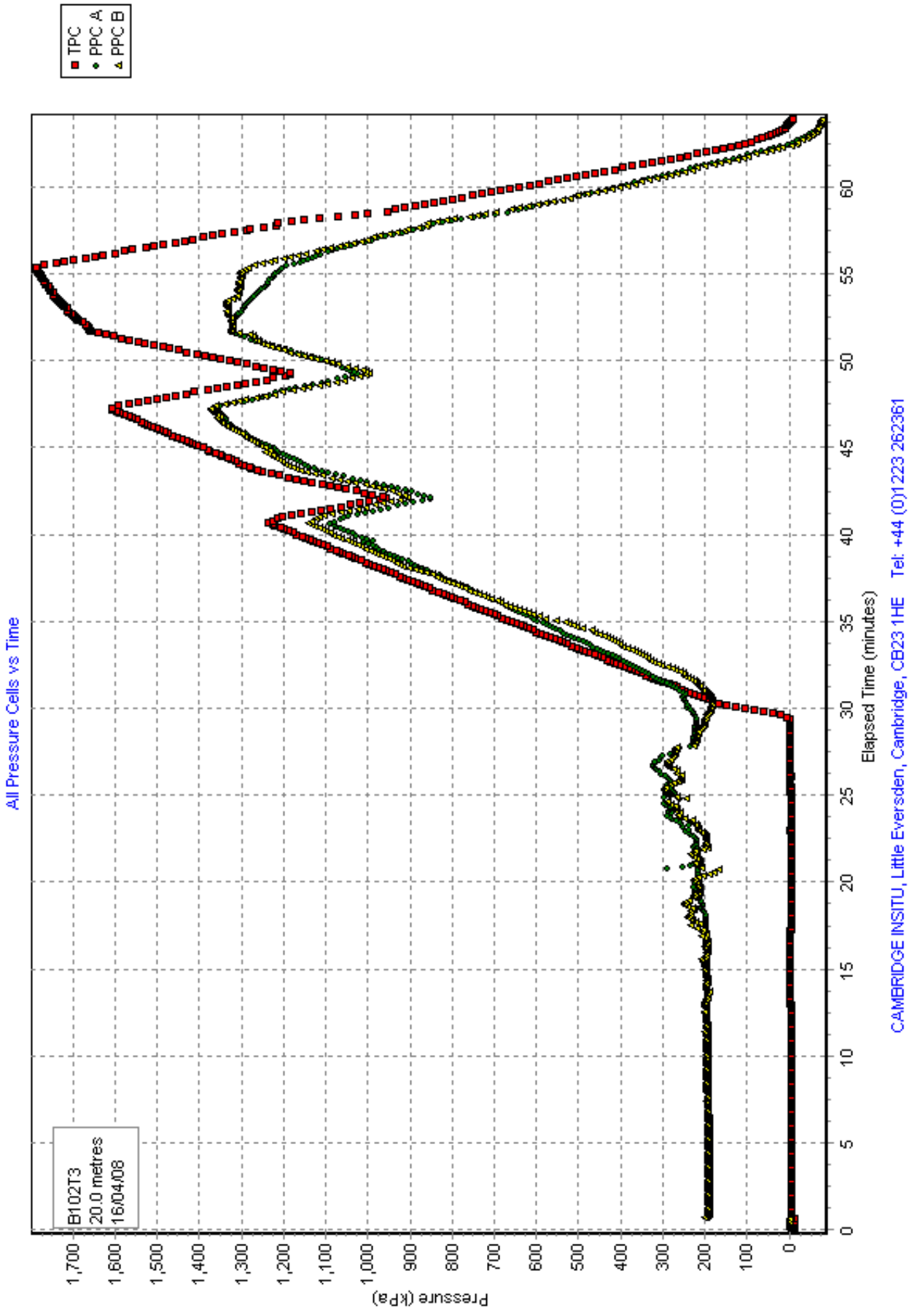
Tester: RW.

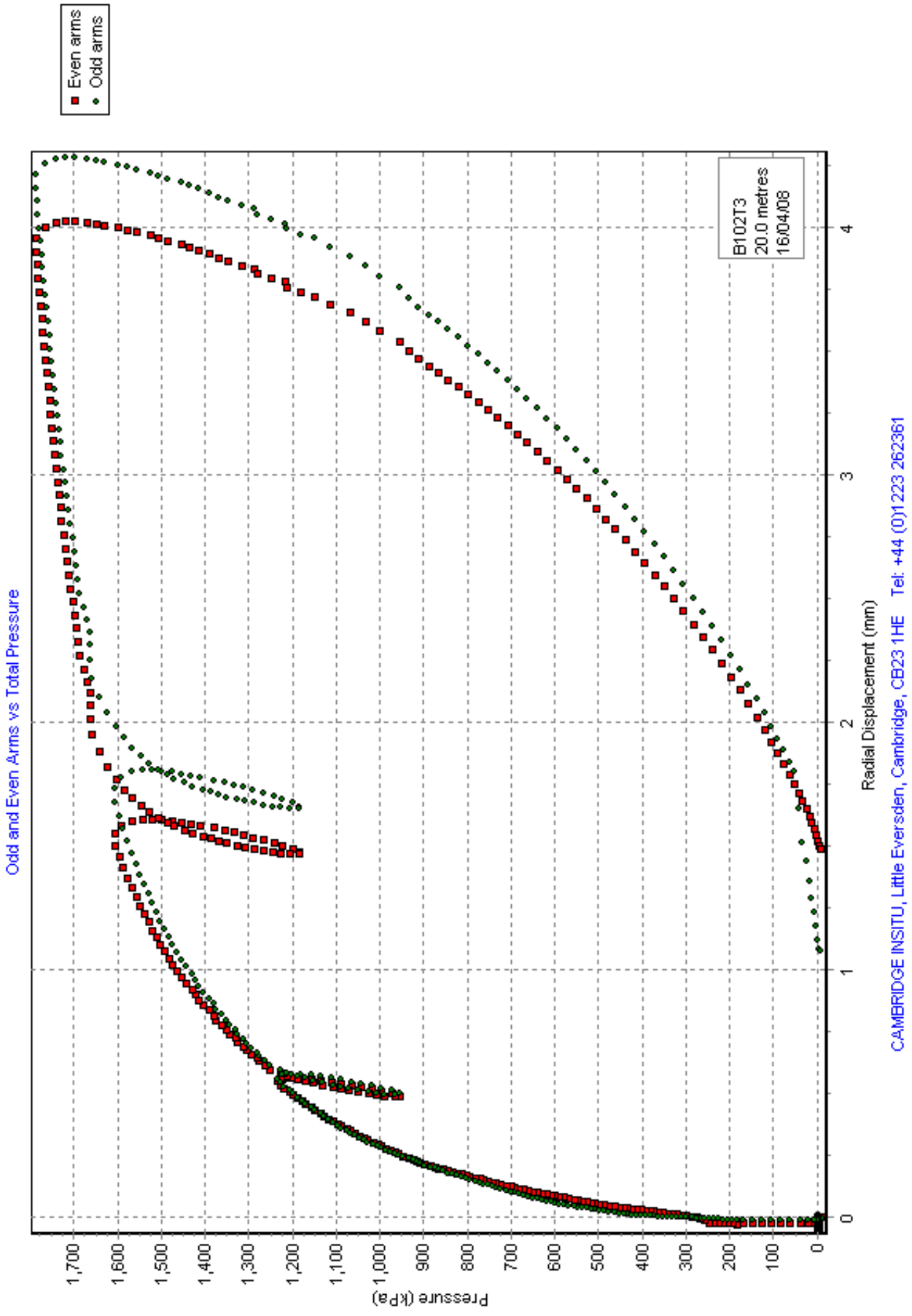
CAMBRIDGE INSITU, Little Eversden, Cambridge CB3 7HE Tel: (01223) 262 361 Fax: (01223) 263 947
SBP6TRS.DOC May 25th, 2001 E-mail: CamInsitu@AOL.com Web site: Cambridge-Insitu.com


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
All Arms vs Total Pressure
B102T3
20.0 metres
16/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
B102T3
20.0 metres
16/04/08
Pressure (kPa)
Radial Displacement (mm)
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
1,400
1,500
1,600
1,700
0
1
2
3
4
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arms 1+4
Arms 2+5
Arms 3+6
B102T3
20.0 metres
16/04/08
Arm Pairs vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


TPC
PPC A
PPC B
All Pressure Cells vs Time
B102T3
20.0 metres
16/04/08
Pressure (kPa)
Elapsed Time (minutes)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T3
20.0 metres
16/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361

B102T4 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]
Project : 36237
Site : Denmark Place
Borehole : BH102
Test name : B102T4
Test date : 16 Apr 08
Test depth : 26.00 Metres
Water table : 5.6 Metres
Ambient PWP : 200.1 kPa
Material : London Clay
Probe : Digital 6 arm weak rock self boring pressuremeter
Diameter : 88.1 mm
Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out
The file includes results from a curve fitting analysis

Analysed by RWW on 17 Apr 08

Remarks:

[RESULTS FOR CAVITY REFERENCE PRESSURE]
Strain Origin (mm) : "Arm ave=0.020"
Po from Marsland & Randolph (kPa) : "Arm ave=447.2"
Po from Lift off (kPa) : "Arm ave=472.6"
PWP versus Total Stress (kPa) : "PPC Ave=332.1"
Best estimate of Po (kPa) : "Arm ave=566.0"

[UNDRAINED STRENGTH PARAMETERS]
Gibson & Anderson 1961 - Cu (kPa) : "Arm ave=287.0"
Limit pressure (kPa) : "Arm ave=2336"
Jefferies 1988 - Cu (kPa) : "Arm ave=288.5"
Undrained yield stress (kPa) : "Arm ave=680.3"

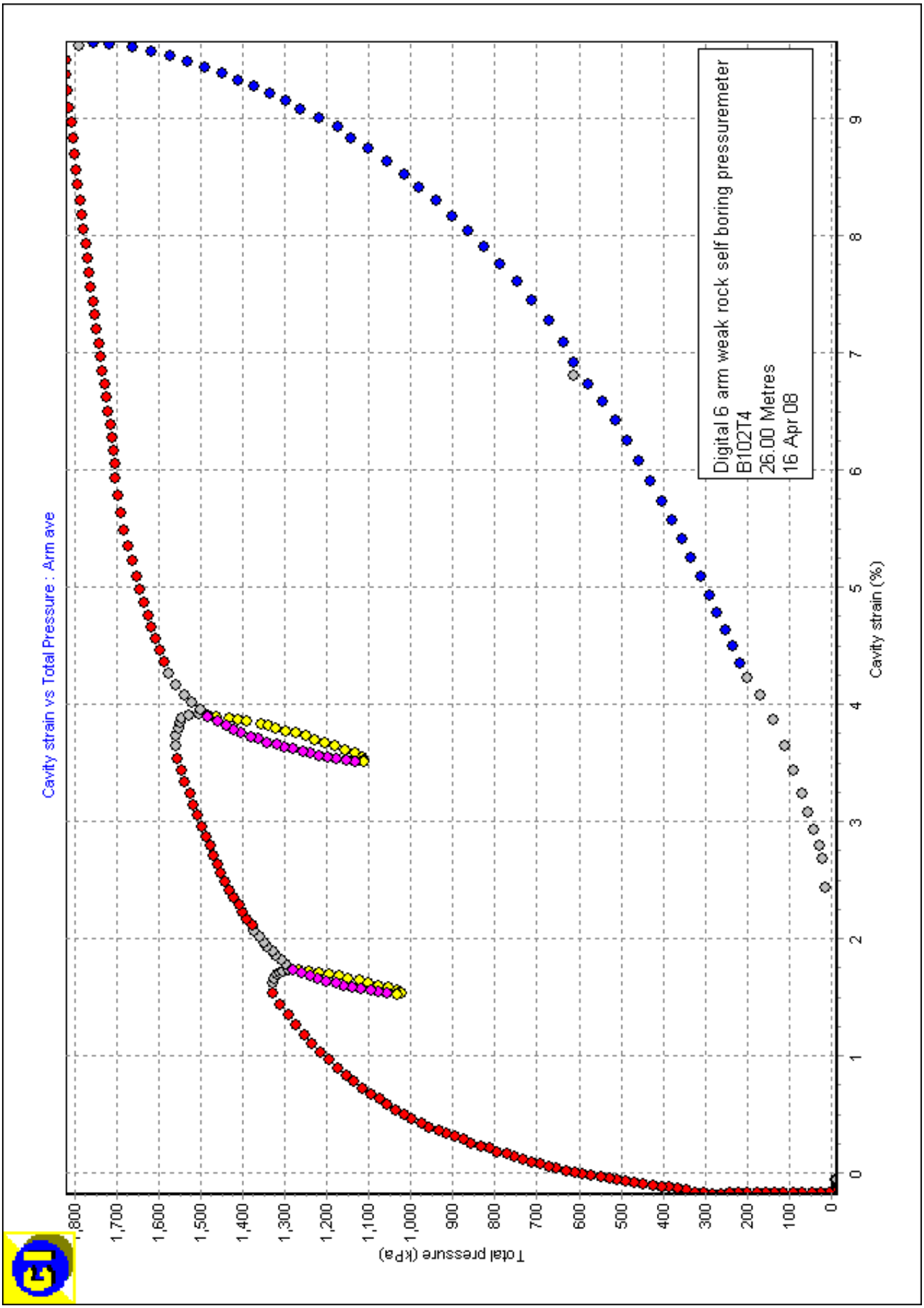
[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=69.3"

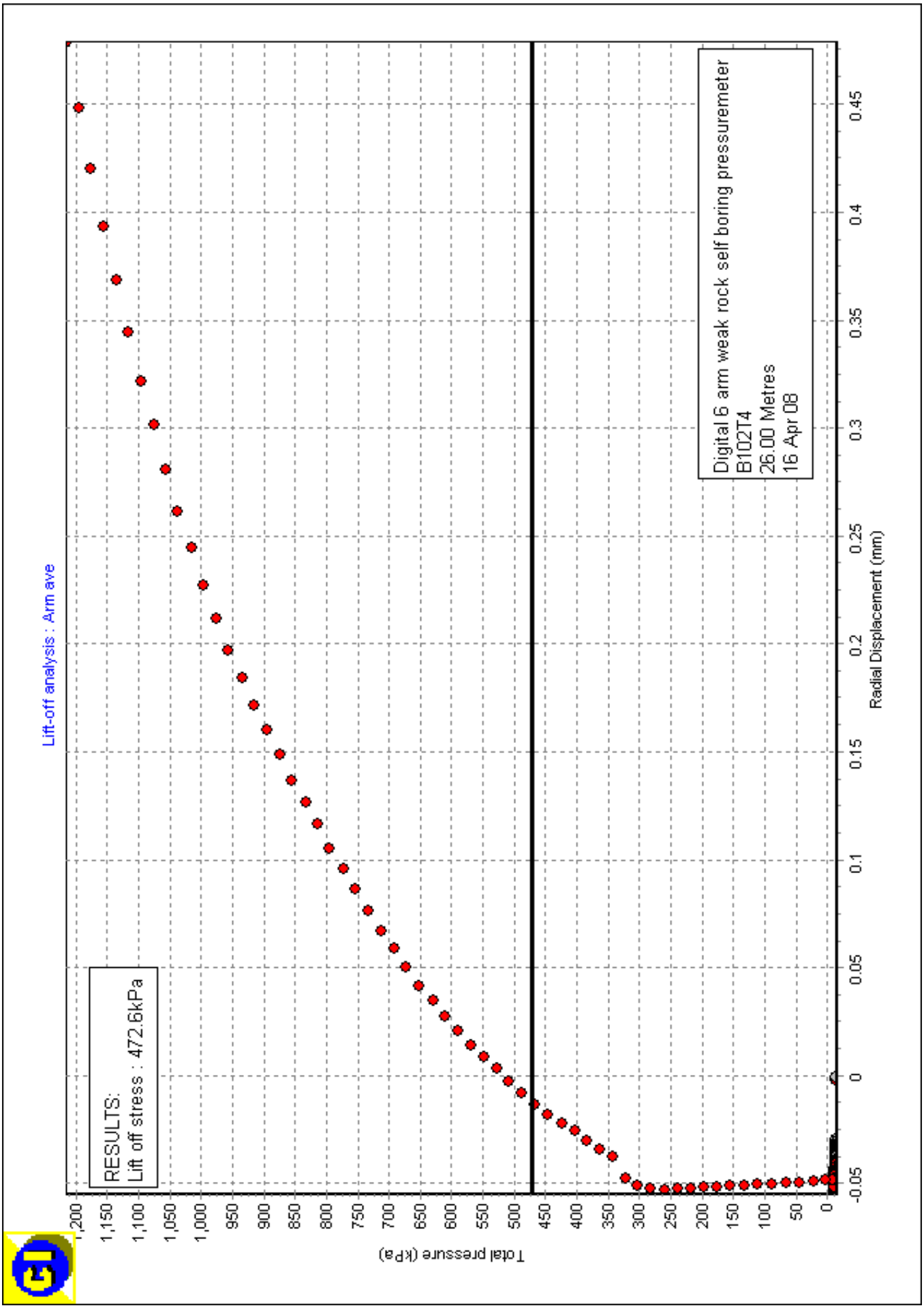
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	62.7	1.644	1152	0.413	259
Arm ave	2	49.8	3.726	1301	0.763	381

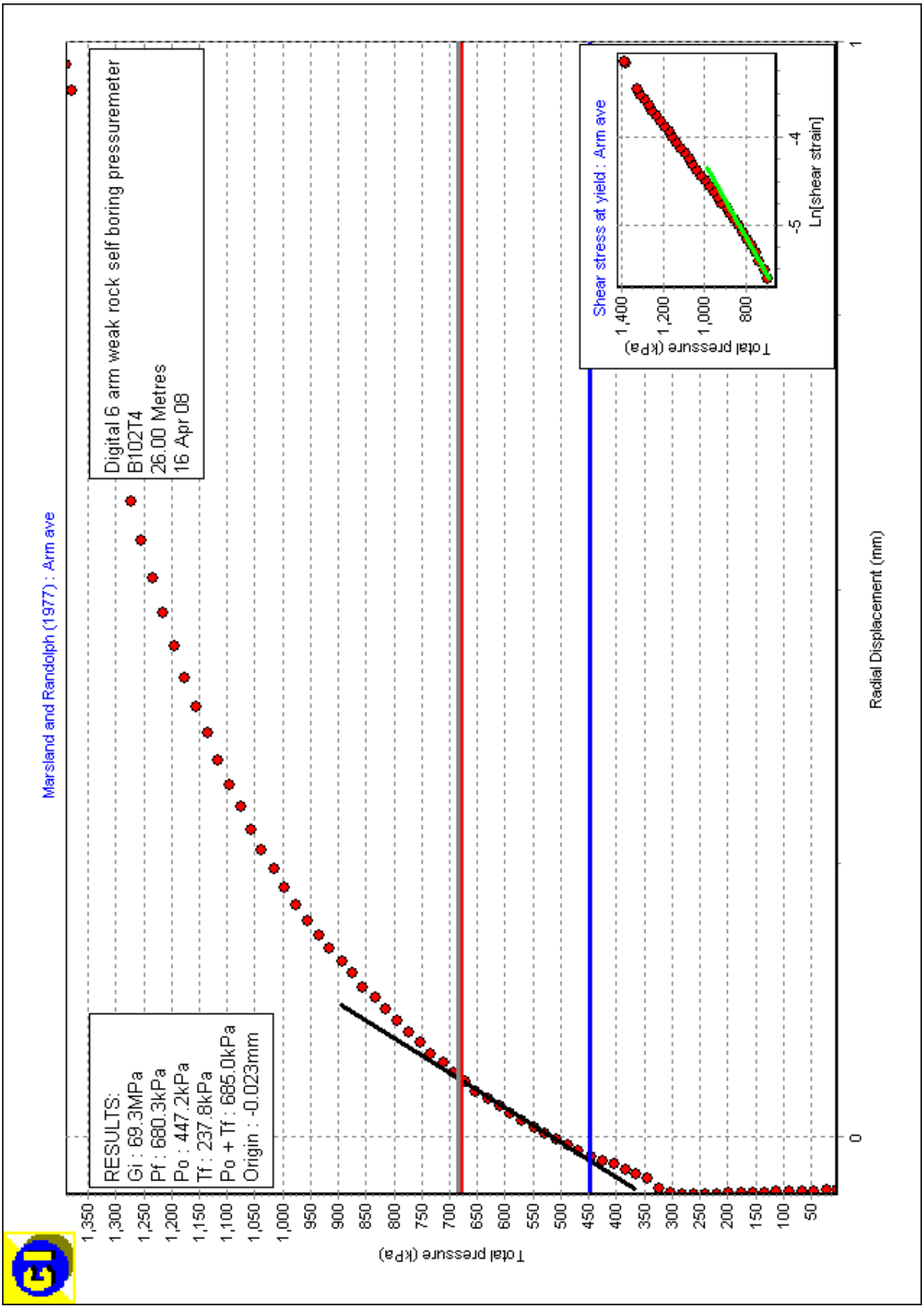
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

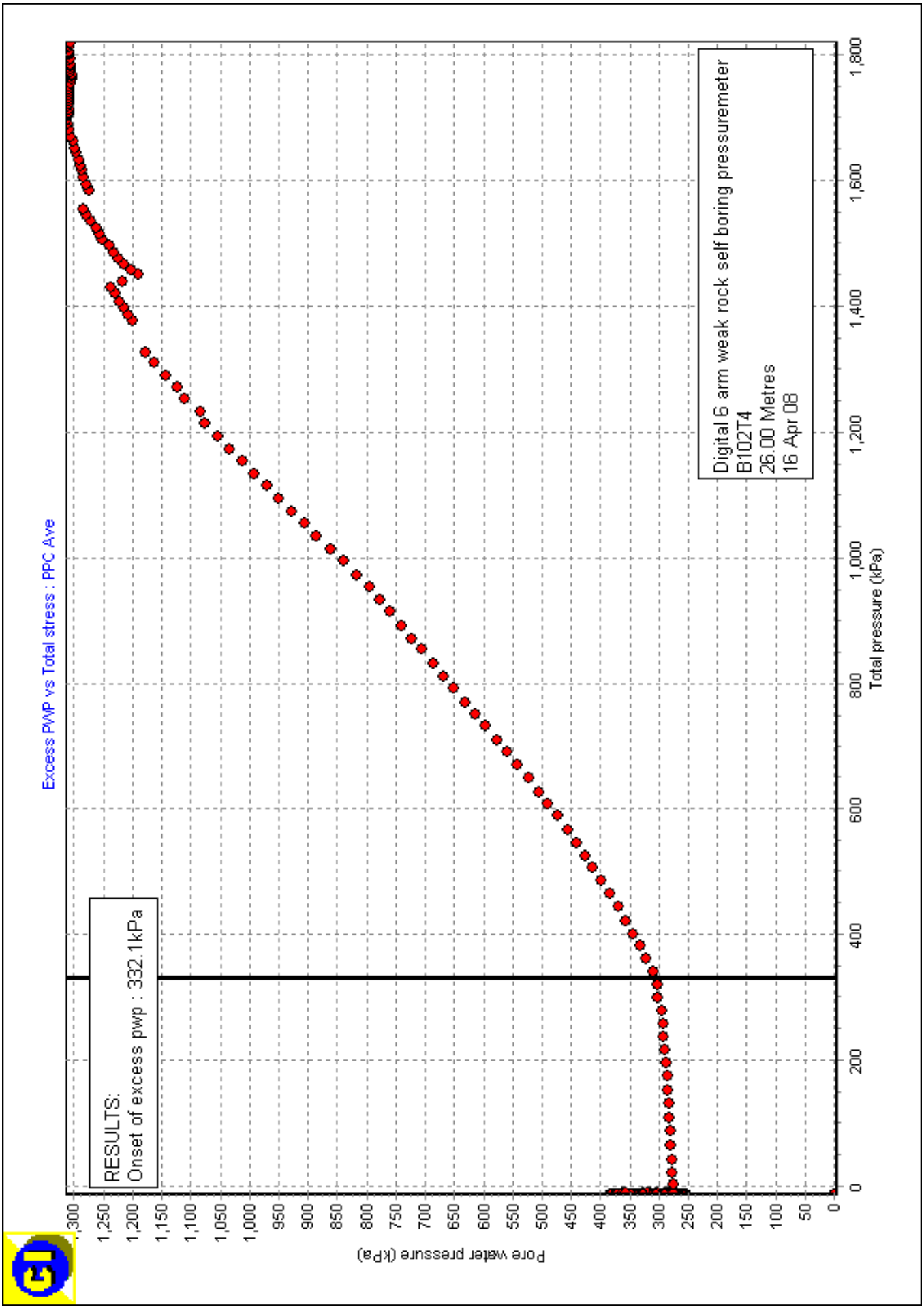
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	10.021	6.662	0.665
Arm ave	2	9.973	6.566	0.658

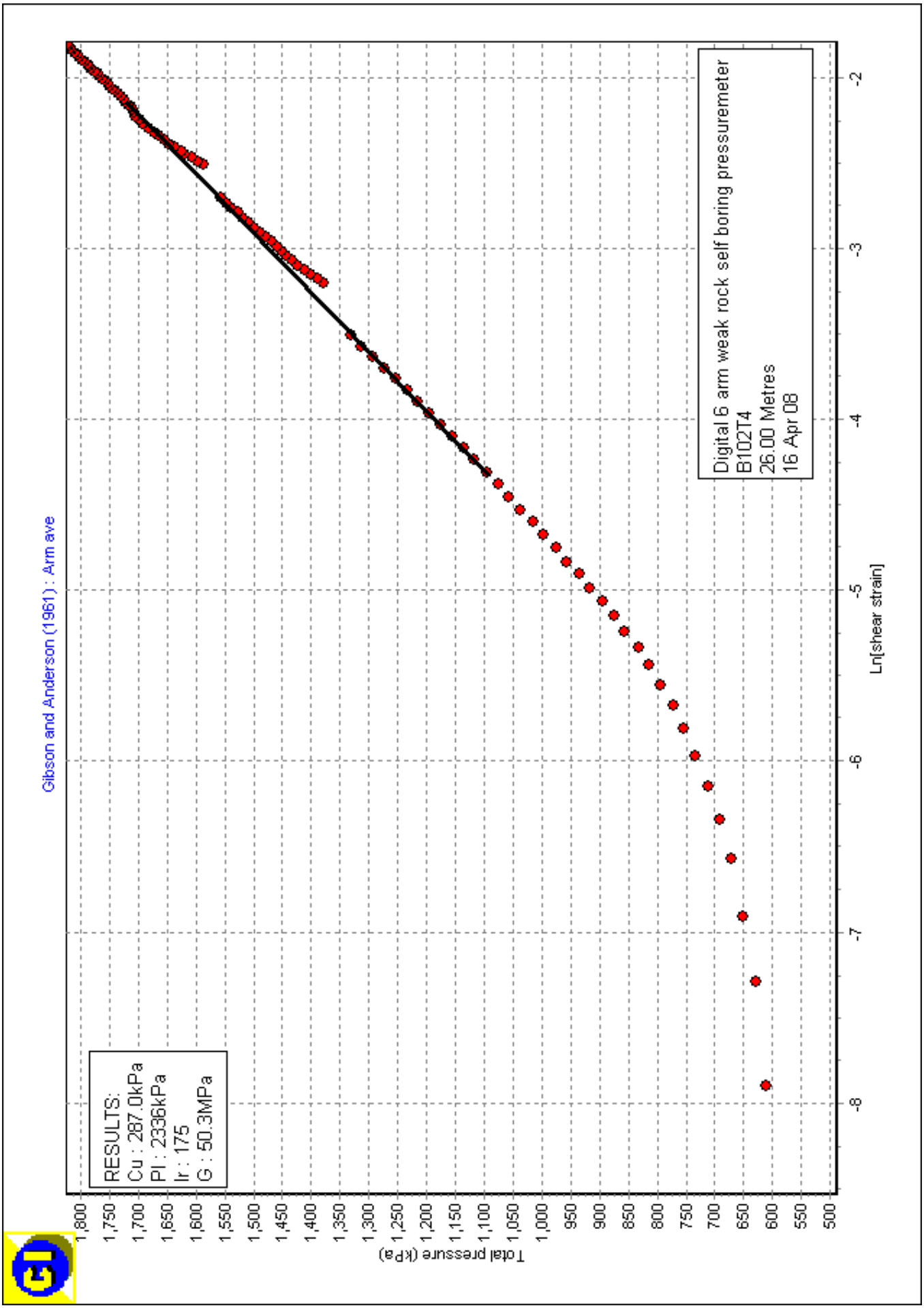
[PARAMETERS USED FOR UNDRAINED CURVE MODELLING]
Axis is Arm ave
Strain Origin (mm) : 0.02
Po (kPa) : 566
Cu (kPa) : 287.0
Limit pressure (kPa) : 2336
Non-linear exponent : 0.658
Calculated alpha (MPa) : 6.122
G at yield (MPa) : 30.0

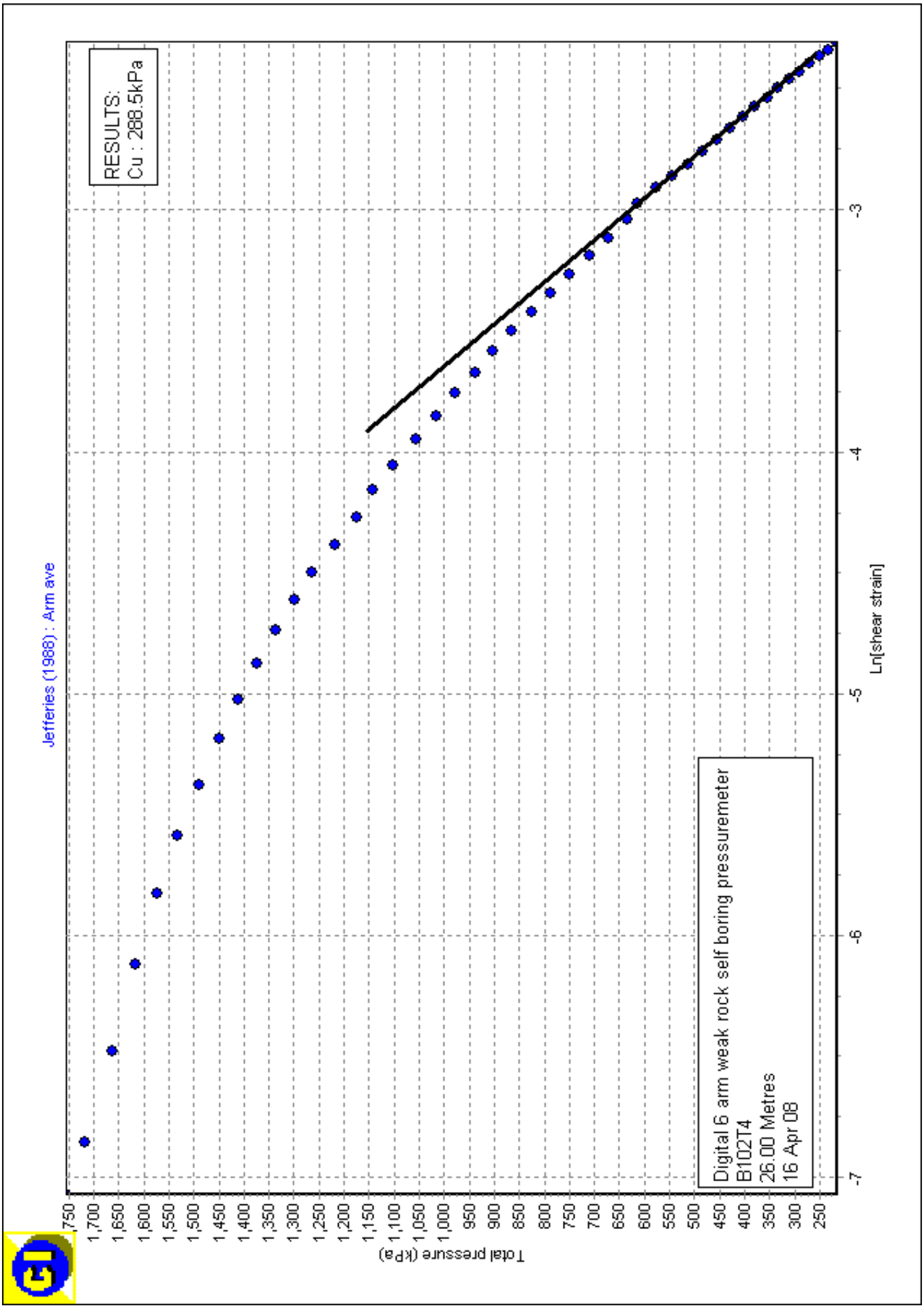

Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Total pressure (kPa)
Cavity strain (%)
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
1,400
1,500
1,600
1,700
1,800
0
1
2
3
4
5
6
7
8
9

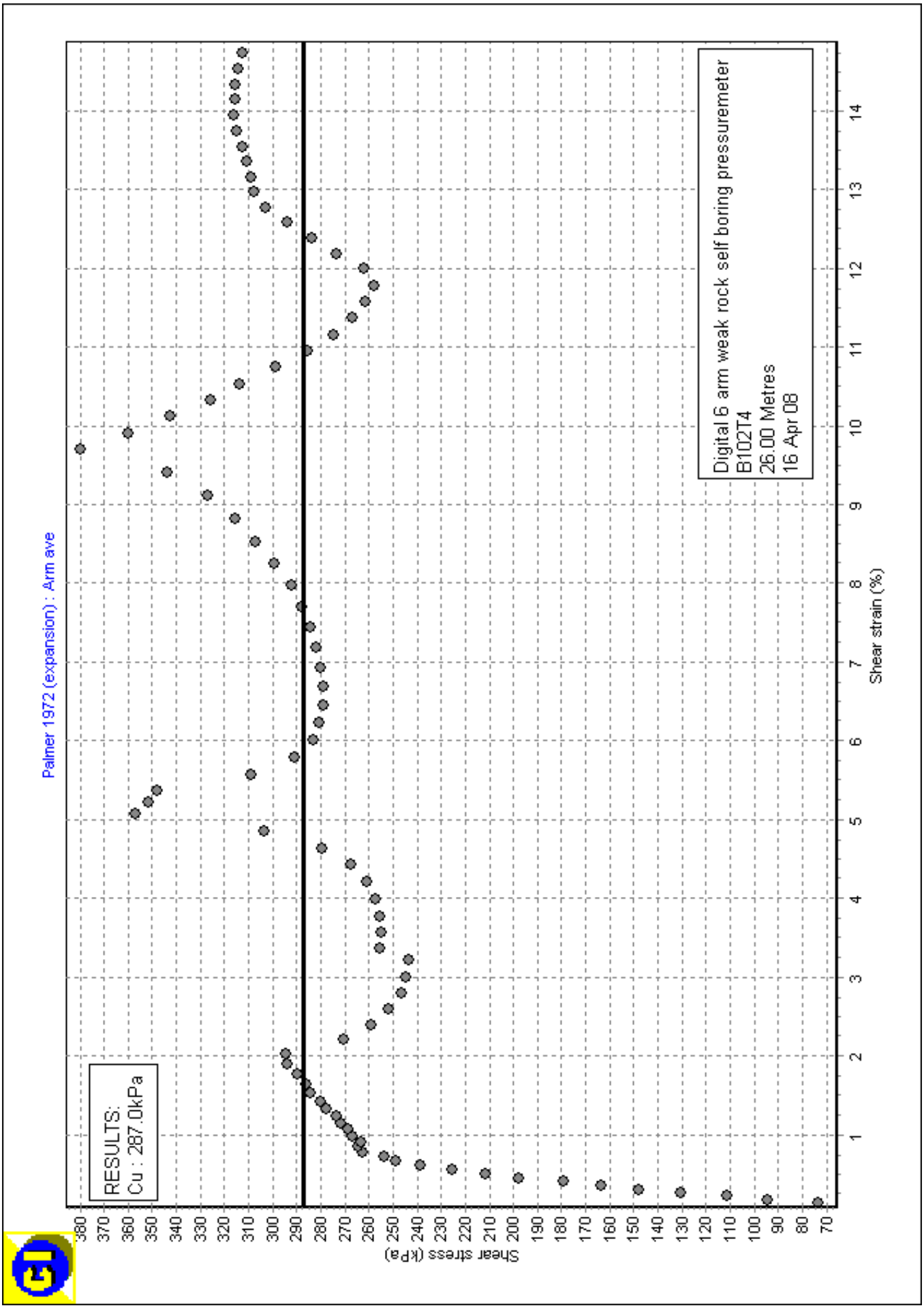

Lift-off analysis : Arm ave
RESULTS:
Lift off stress : 472.6kPa
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Total pressure (kPa)
Radial Displacement (mm)

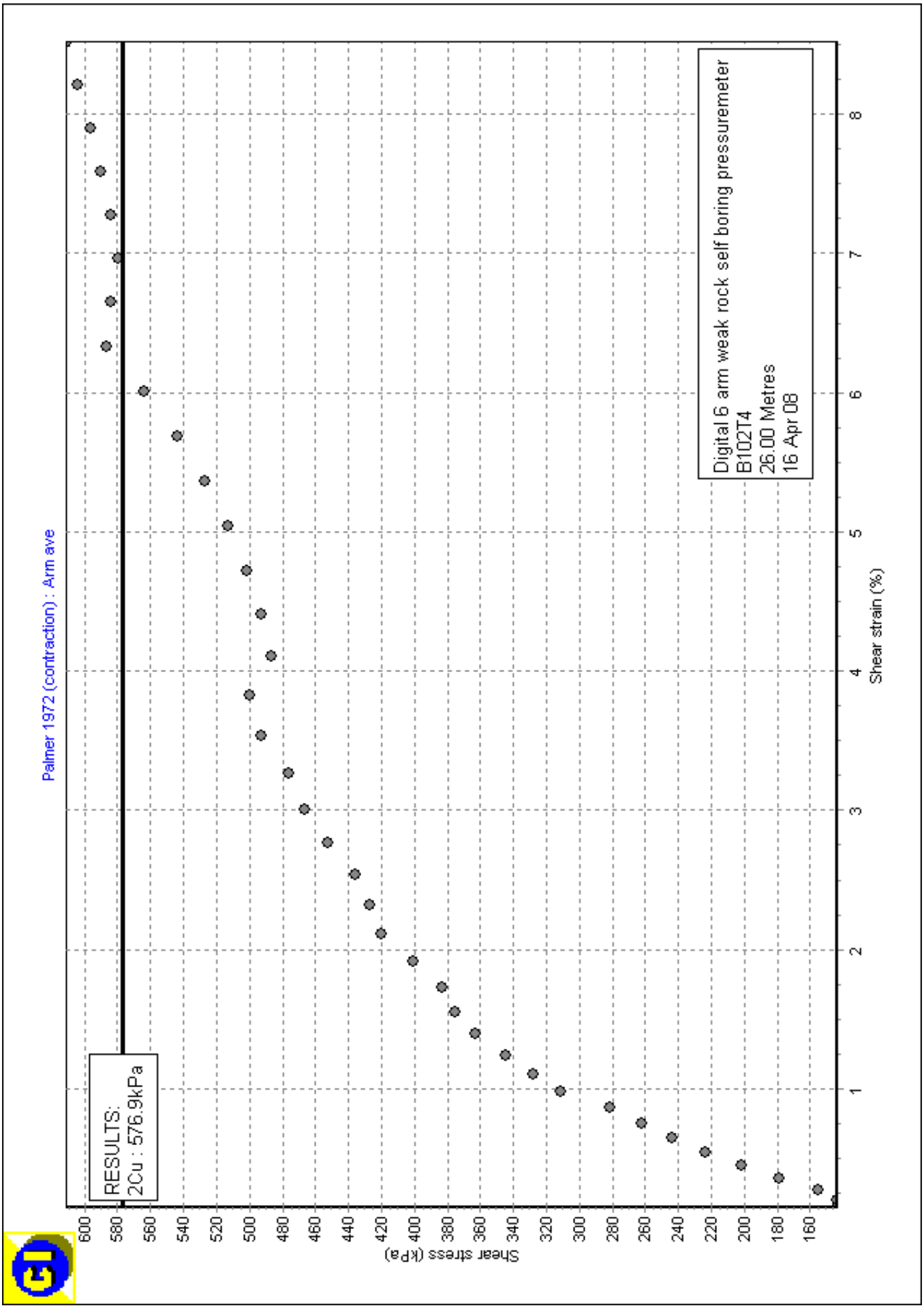

Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
RESULTS:
Gi : 69.3MPa
Pf : 680.3kPa
Po : 447.2kPa
Tf : 237.8kPa
Po + Tf : 685.0kPa
Origin : -0.023mm
Marsland and Randolph (1977) : Arm ave
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]

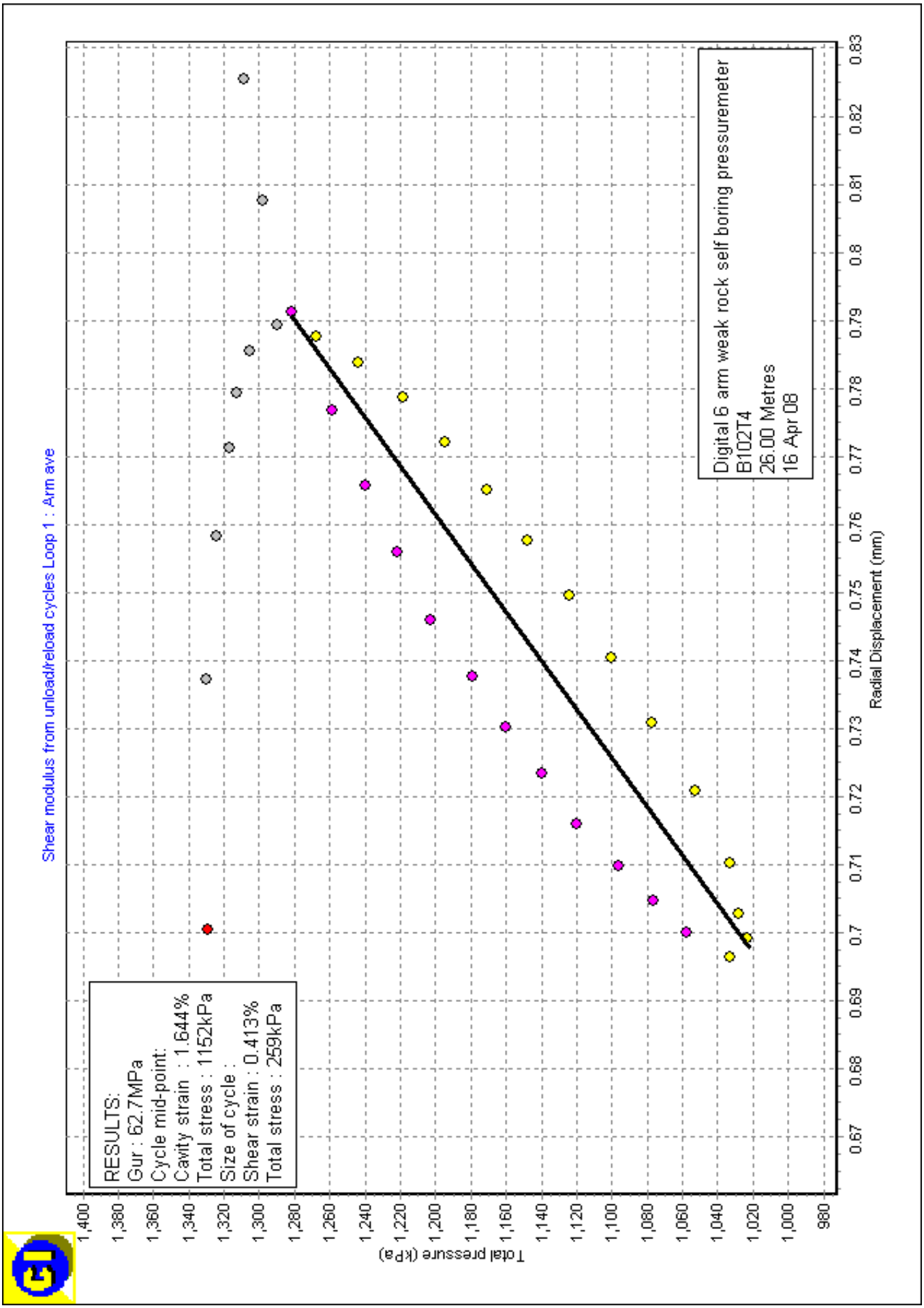

Excess PWP vs Total stress : PPC Ave
RESULTS:
Onset of excess pwp : 332.1kPa
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Pore water pressure (kPa)
Total pressure (kPa)
0
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1,000
1,050
1,100
1,150
1,200
1,250
1,300
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800

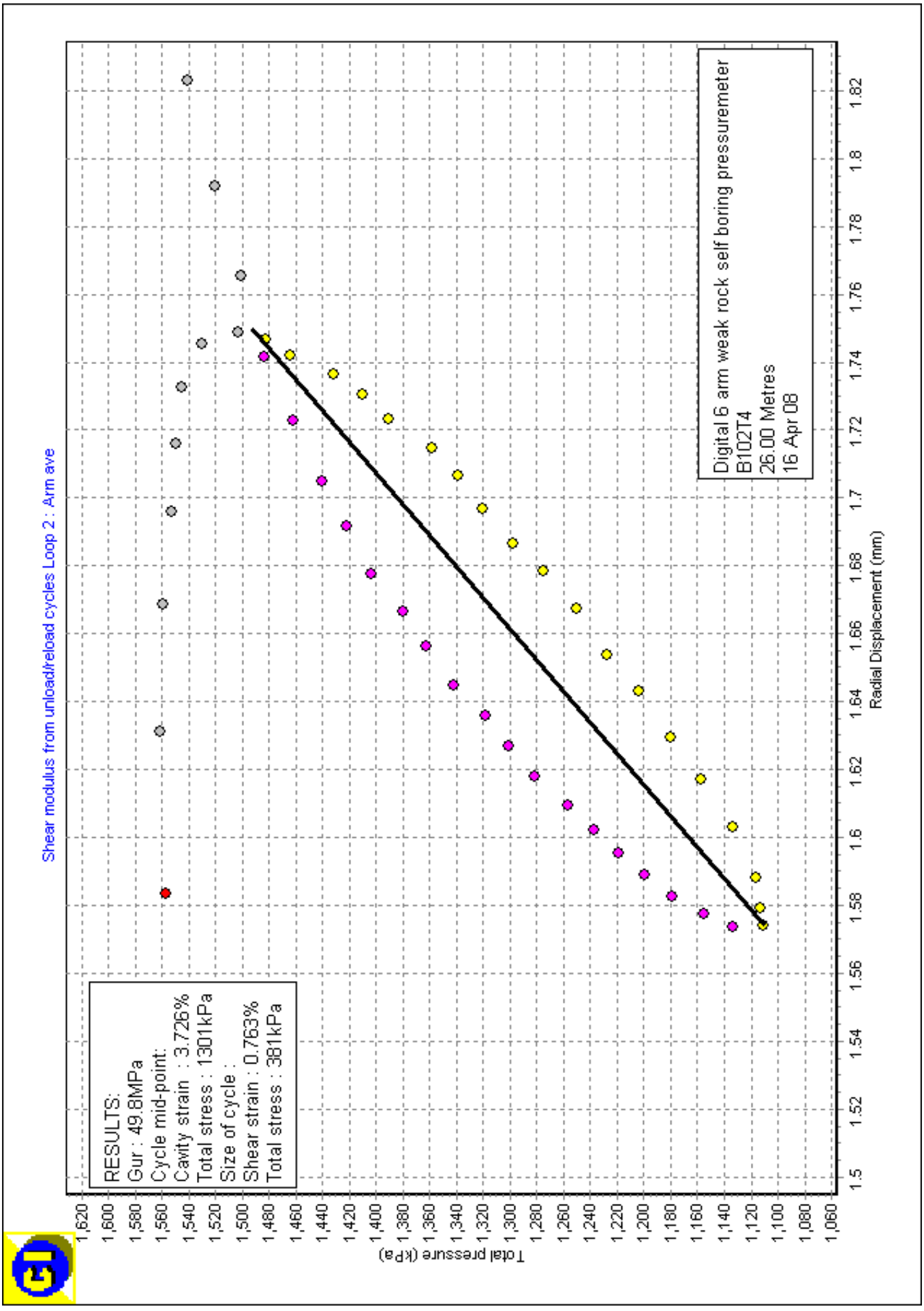

Gibson and Anderson (1961) : Arm ave
RESULTS:
Cu : 287.0kPa
PI : 2336kPa
Ir : 175
G : 50.3MPa
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Total pressure (kPa)
Ln[shear strain]

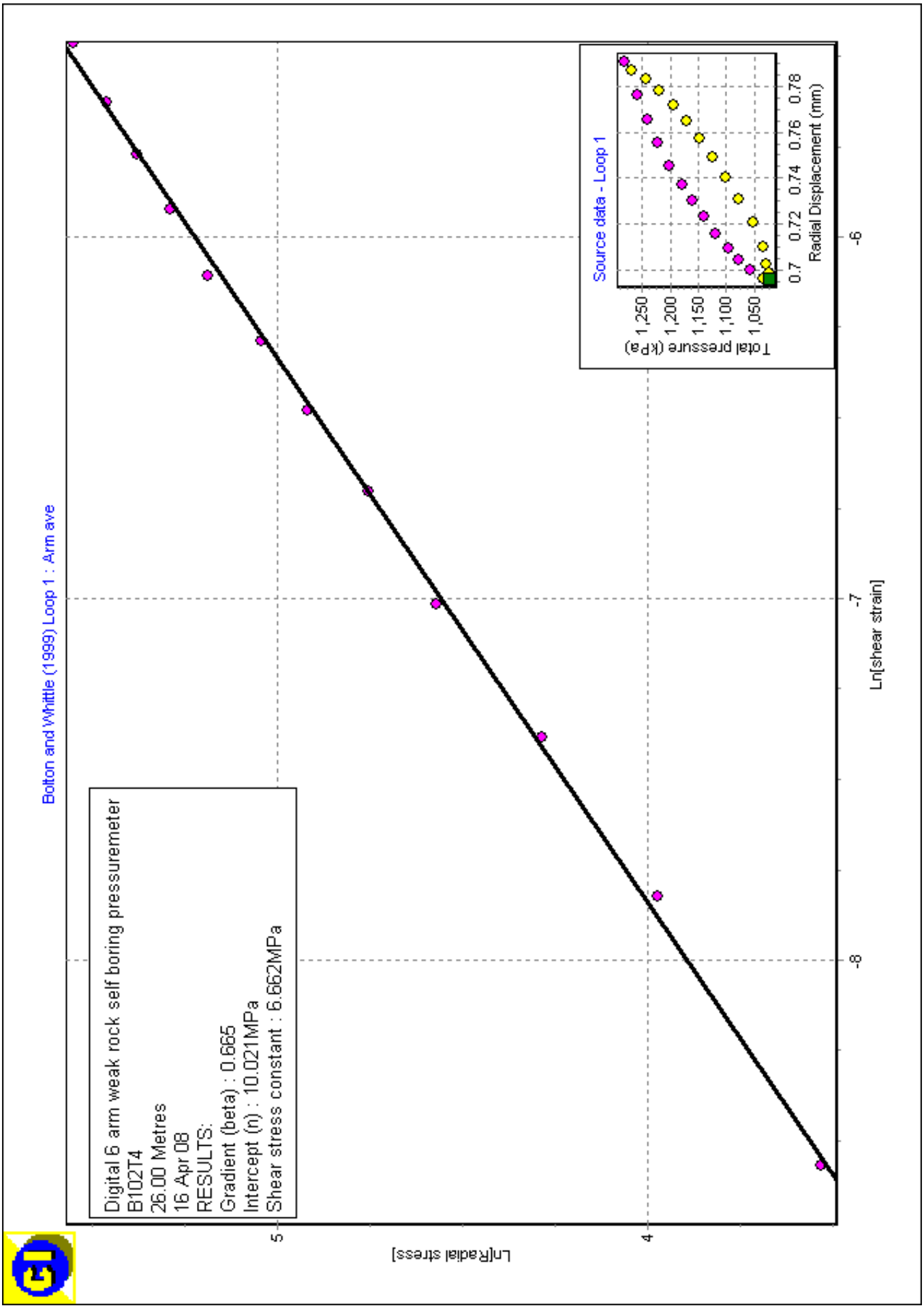

RESULTS:
Cu : 288.5kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Total pressure (kPa)
Ln[shear strain]

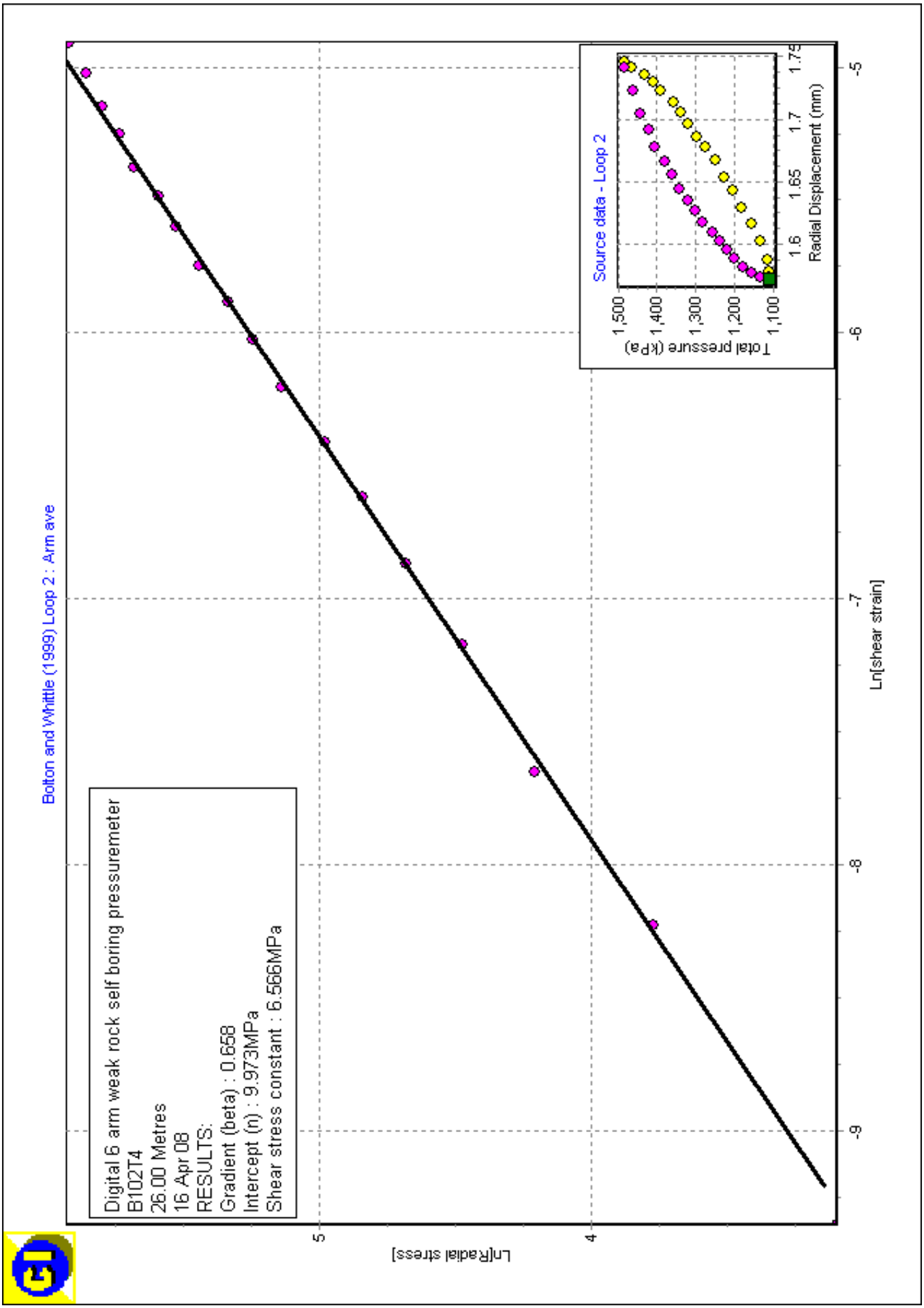

Palmer 1972 (expansion) : Arm ave
RESULTS:
Cu : 287.0kPa
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Shear stress (KPa)
Shear strain (%)

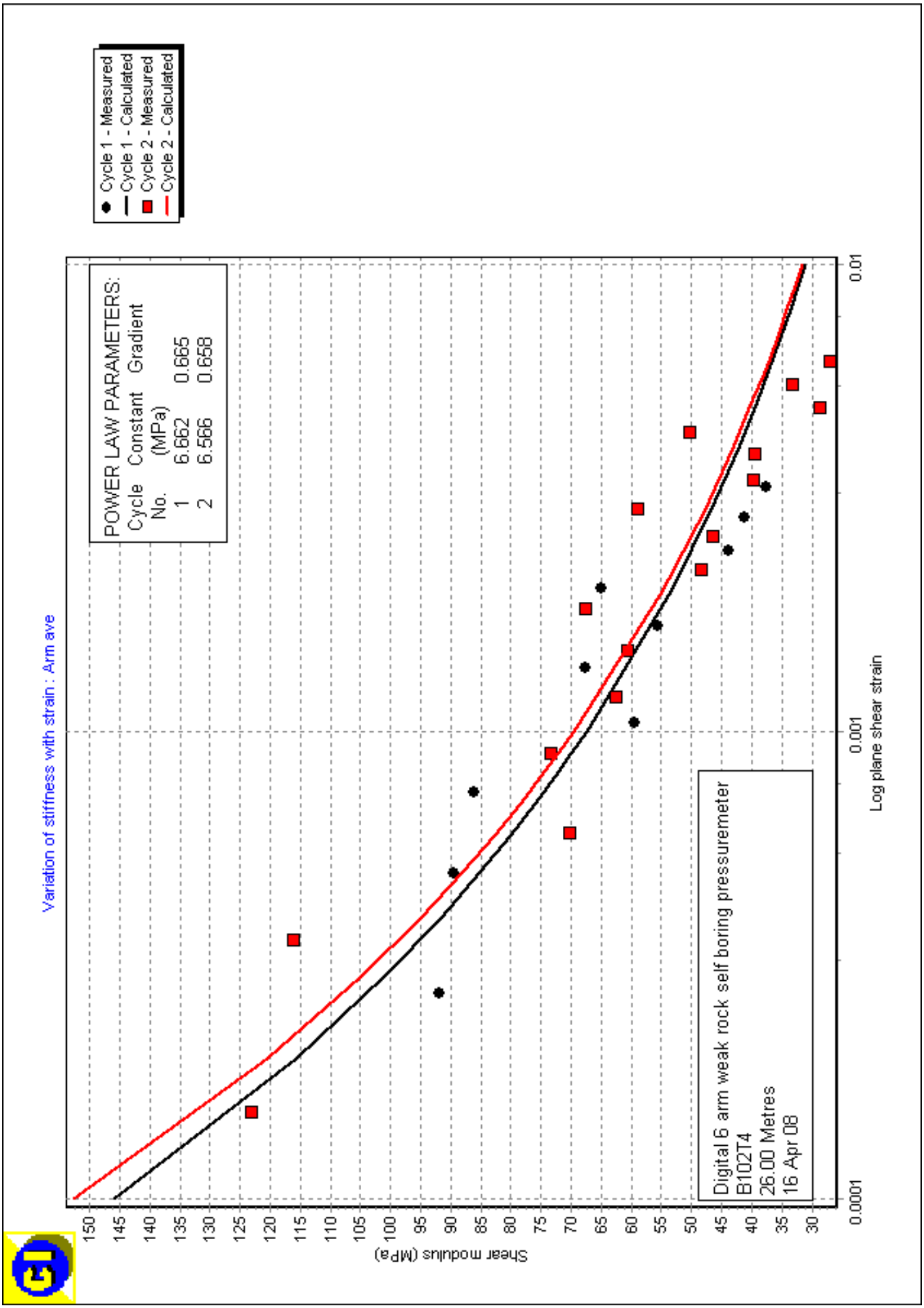

Palmer 1972 (contraction) : Arm ave
RESULTS:
2Cu : 576.9kPa
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Shear stress (kPa)
Shear strain (%)

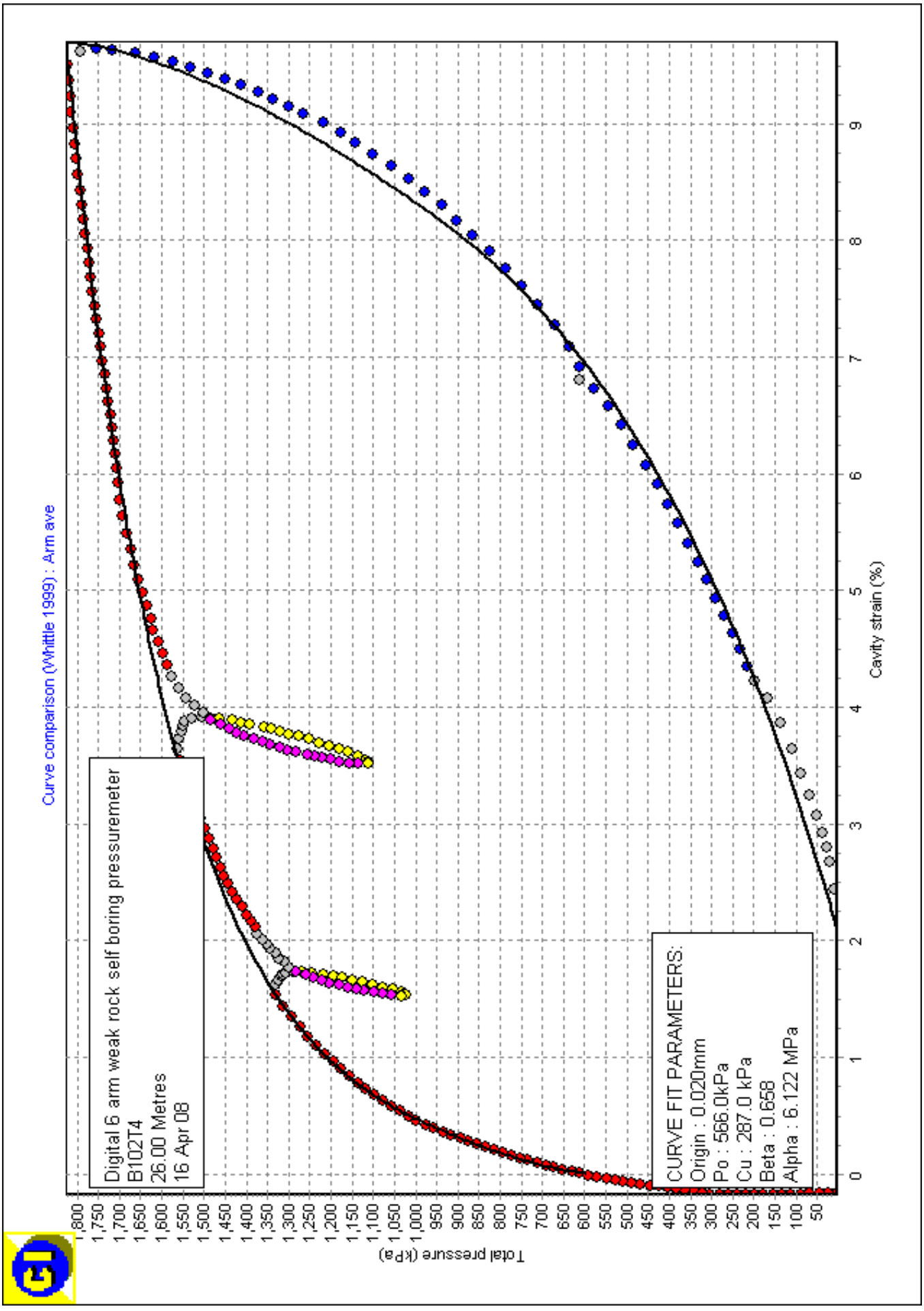

Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 62.7MPa
Cycle mid-point:
Cavity strain : 1.644%
Total stress : 1152kPa
Size of cycle :
Shear strain : 0.413%
Total stress : 259kPa
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 49.8MPa
Cycle mid-point:
Cavity strain : 3.726%
Total stress : 1301kPa
Size of cycle :
Shear strain : 0.763%
Total stress : 381kPa
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
RESULTS:
Gradient (beta) : 0.665
Intercept (n) : 10.021MPa
Shear stress constant : 6.662MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 1
Total pressure (kPa)
Radial Displacement (mm)


Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
RESULTS:
Gradient (beta) : 0.658
Intercept (n) : 9.973MPa
Shear stress constant : 6.566MPa
Bolton and Whittle (1999) Loop 2 : Arm ave
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)


Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
POWER LAW PARAMETERS:
Cycle No. Constant (MPa) Gradient
1 6.662 0.665
2 6.566 0.658
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08


Curve comparison (Whittle 1999) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T4
26.00 Metres
16 Apr 08
CURVE FIT PARAMETERS:
Origin : 0.020mm
Po : 566.0kPa
Cu : 287.0 kPa
Beta : 0.658
Alpha : 6.122 MPa
Total pressure (kPa)
Cavity strain (%)

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
DENMARK PLACE	16/4/08	WED	102	4	26.0

Weather:- FINE Material:- LONDON CLAY

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
?	14:25	15:05	1m.	1m/30min.	90 BARS

Ground level :- Orientation:- NR.

Water Press.	Inst.OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
>200Bar	87.1	85.1	73 RR	3mm Back	'Mercy'

Drilling Remarks:-

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
1%/min	S (L)	65s	120BAR	12.52	TRIAX	1000kPa

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-113	85	-57	38	-91	129	-1048	-914	-2451	Ground Level Zeros
									Pre-drilling Zeros
									Post-drilling Zeros
-117	74	-72	23	-108	+103	-974	-856	-2450	Pre-test Zeros
									Ground Level Zeros

Test starts:- 15.08

Line	Notes
399	Loop 1 PR5
424	PR4
459	Loop 2 PR5
517	PR3
543	unload

Test ends:- 15:38 Max Press:- 1972kPa

Calibrated Data details:

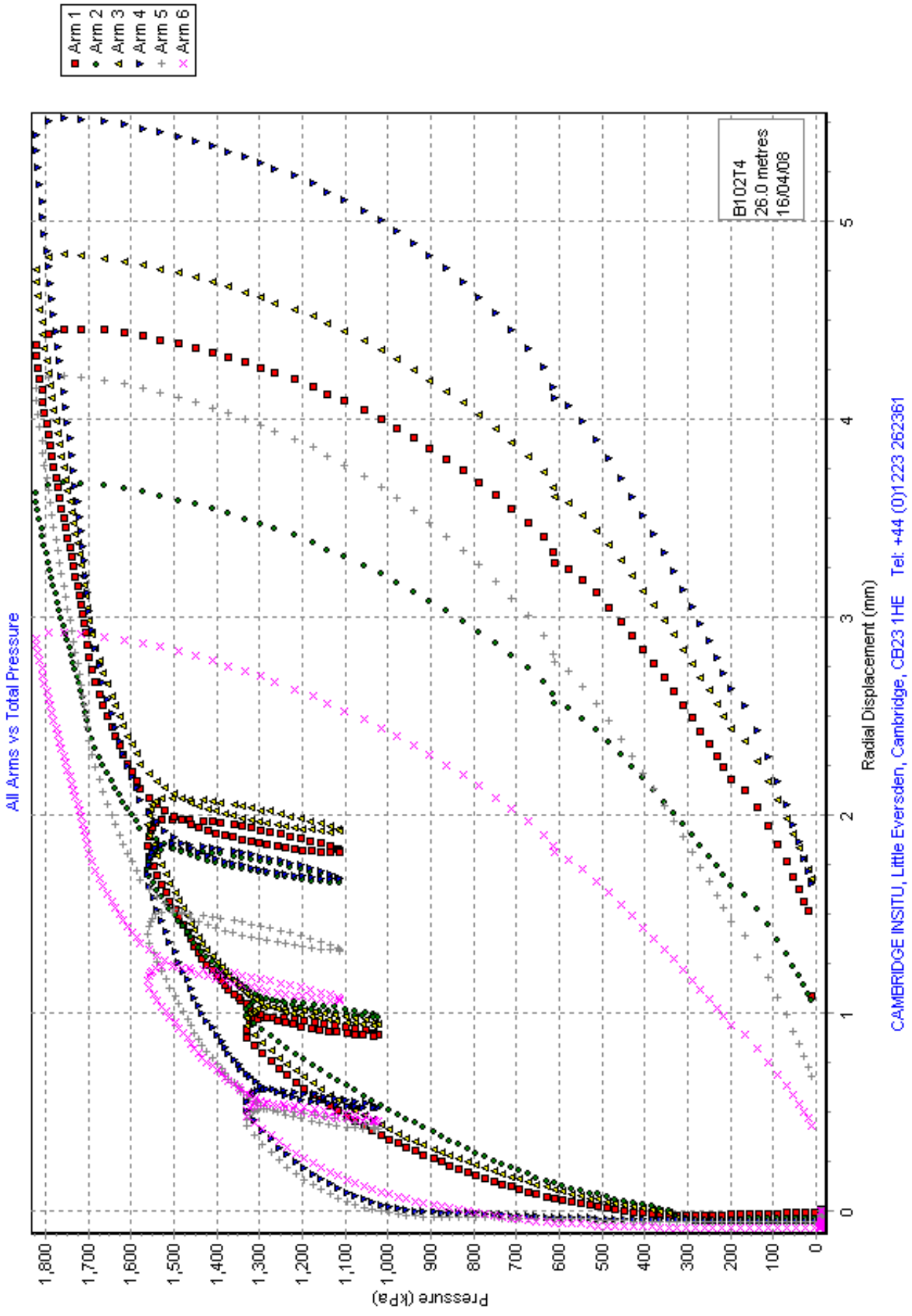
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
W013077	W013072	10/4/08	11/4/08

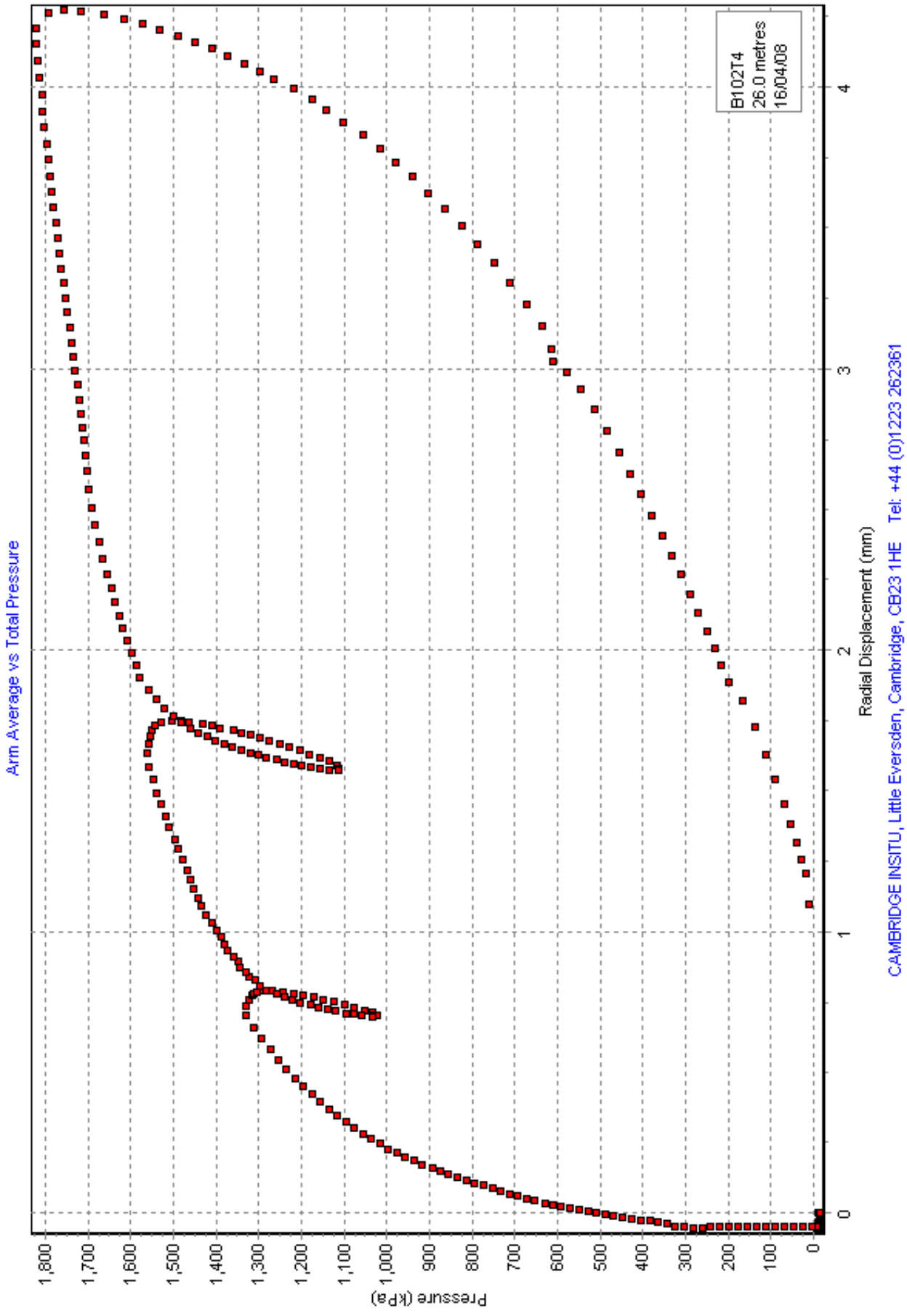
TEST REMARKS:

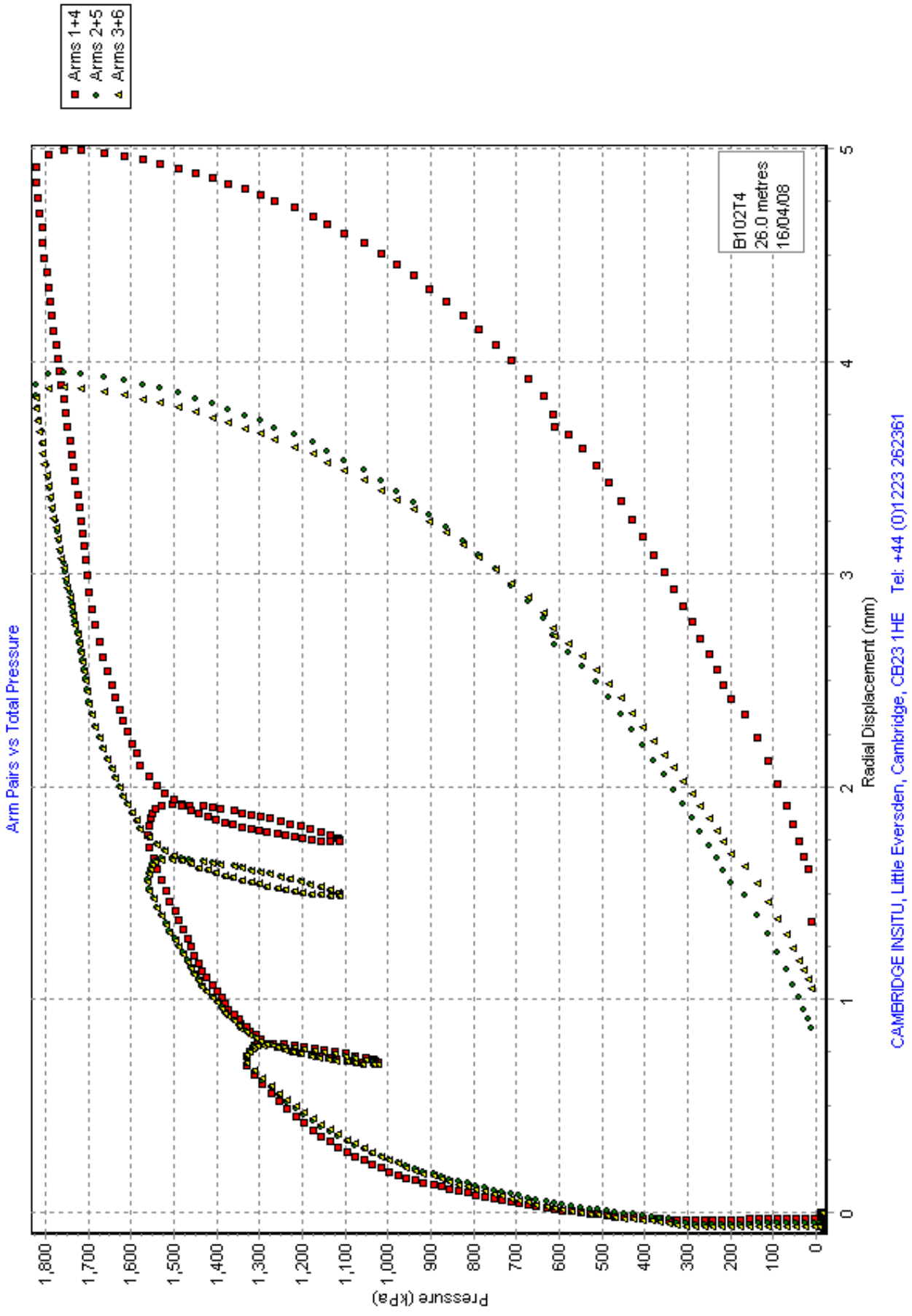
Driller: DAN

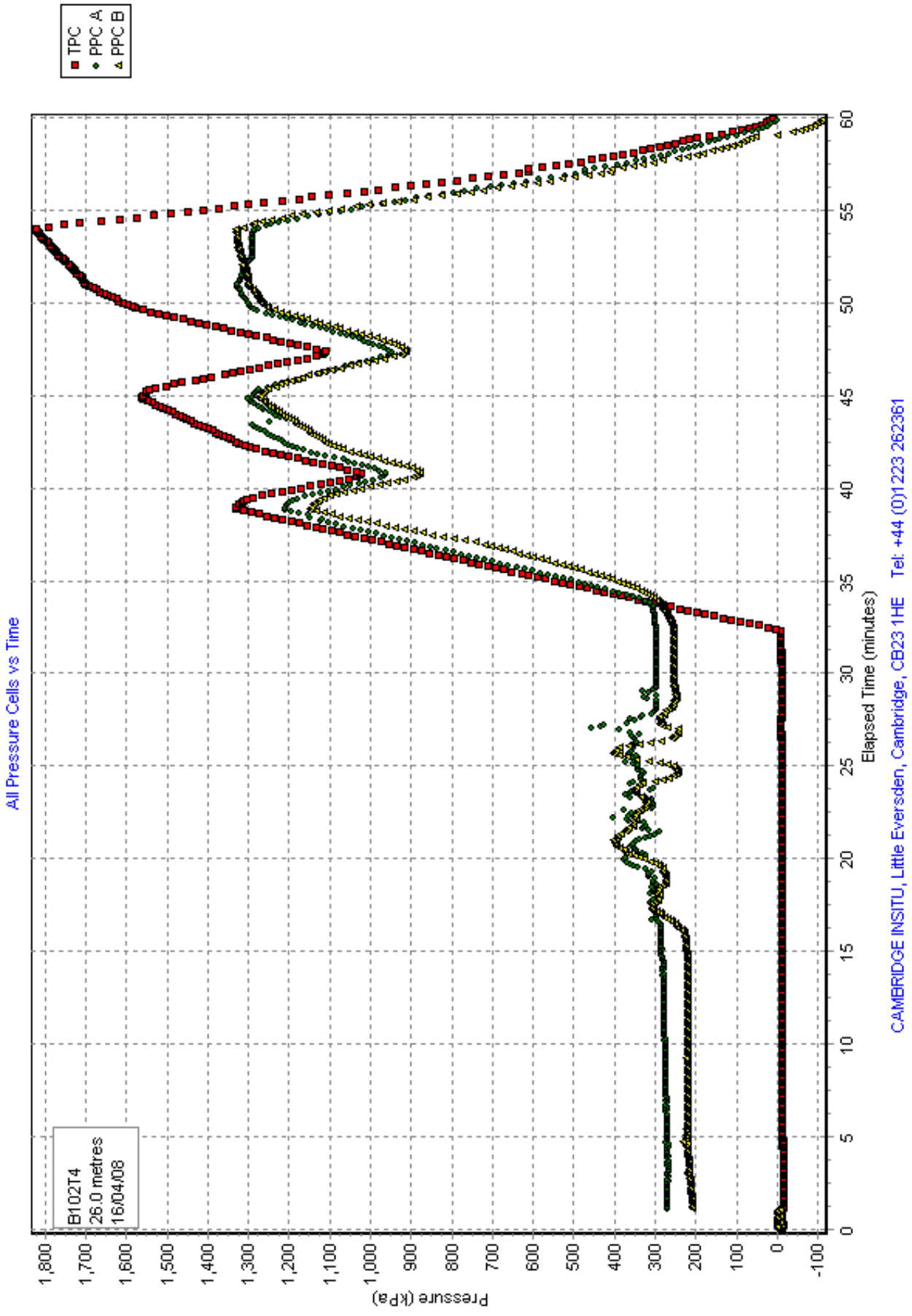
Tester: RJO

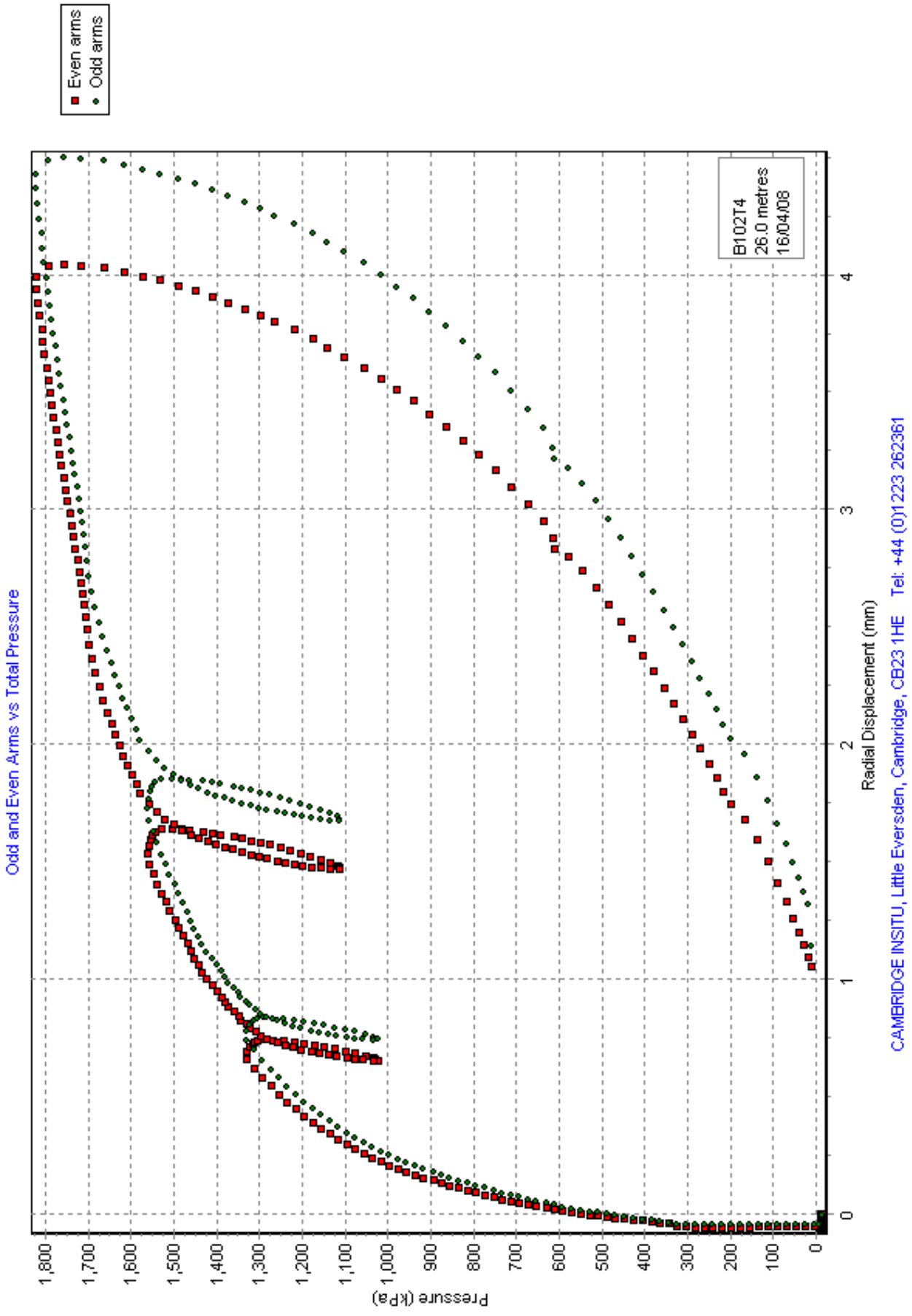
CAMBRIDGE INSITU, Little Eversden, Cambridge CB3 7HE Tel: (01223) 262 361 Fax: (01223) 263 947
SBP6TRS.DOC May 25th, 2001 E-mail: CamInsitu@AOL.com Web site: Cambridge-Insitu.com


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
All Arms vs Total Pressure
B102T4
26.0 metres
16/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
B102T4
26.0 metres
16/04/08
Pressure (kPa)
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
Radial Displacement (mm)
0
1
2
3
4
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Pairs vs Total Pressure
Arms 1+4
Arms 2+5
Arms 3+6
B102T4
26.0 metres
16/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


TPC
PPC A
PPC B
All Pressure Cells vs Time
B102T4
26.0 metres
16/04/08
Pressure (kPa)
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
-100
Elapsed Time (minutes)
0
5
10
15
20
25
30
35
40
45
50
55
60
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T4
26.0 metres
16/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361

B102T5 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]
Project : 36237
Site : Denmark Place
Borehole : BH102
Test name : B102T5
Test date : 17 Apr 08
Test depth : 33.00 Metres
Water table : 5.6 Metres
Ambient PWP : 268.8 kPa
Material : Lambeth Group - clay
Probe : Digital 6 arm weak rock self boring pressuremeter
Diameter : 88.1 mm
Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out
The file includes results from a curve fitting analysis

Analysed by RWW on 18 Apr 08

Remarks: Reddish/Grey clay, very stiff - SAF

[RESULTS FOR CAVITY REFERENCE PRESSURE]
Strain Origin (mm) : "Arm ave=0.420"
Po from Marsland & Randolph (kPa) : "Arm ave=839.5"
Po from Lift off (kPa) : "Arm ave=849.5"
PWP versus Total Stress (kPa) : "PPC Ave=358.4"
Best estimate of Po (kPa) : "Arm ave=1006.0"

[UNDRAINED STRENGTH PARAMETERS]
Gibson & Anderson 1961 - Cu (kPa) : "Arm ave=664.7"
Limit pressure (kPa) : "Arm ave=4962"
Jefferies 1988 - Cu (kPa) : "Arm ave=658.5"
Undrained yield stress (kPa) : "Arm ave=1279.6"

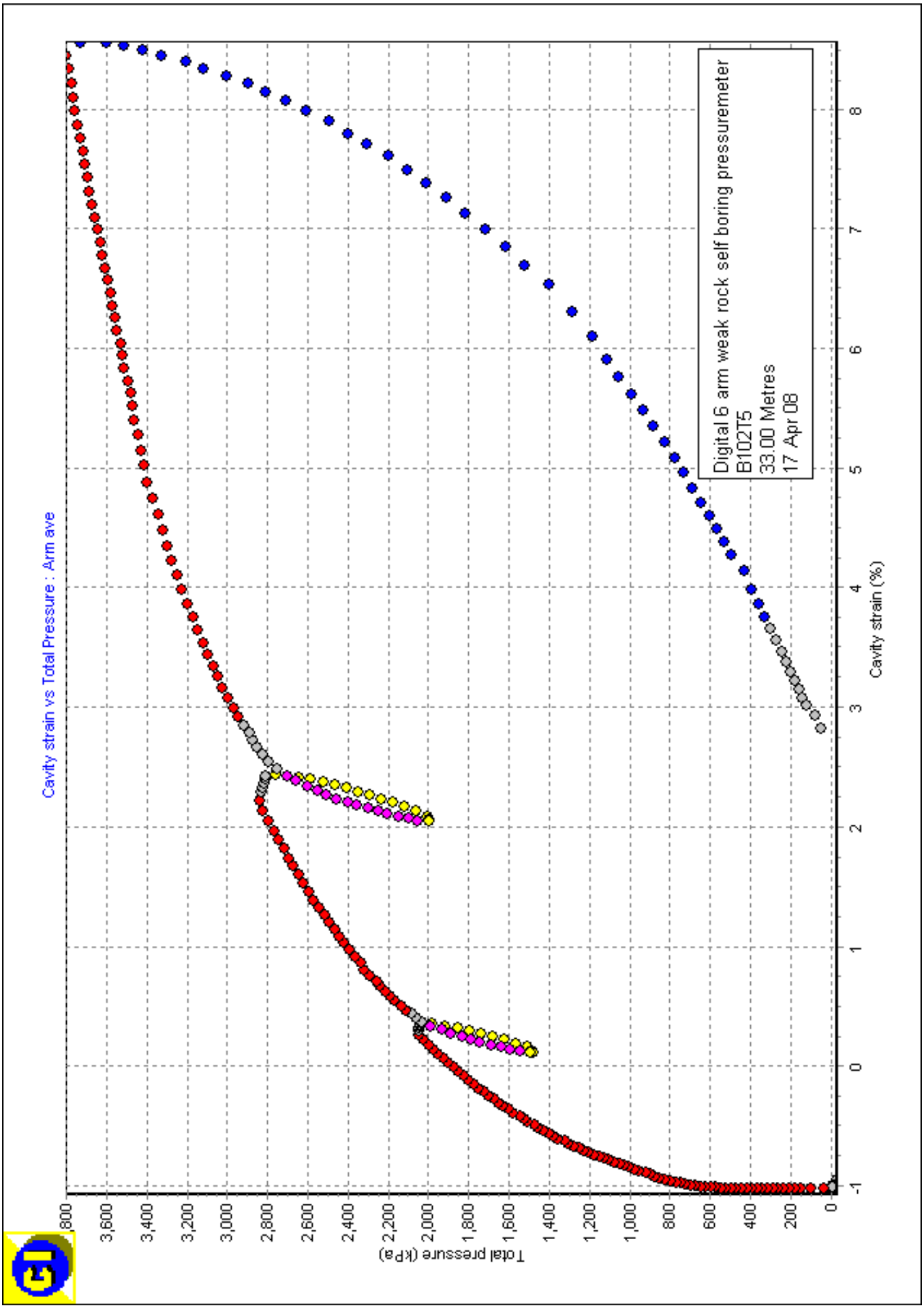
[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=79.4"

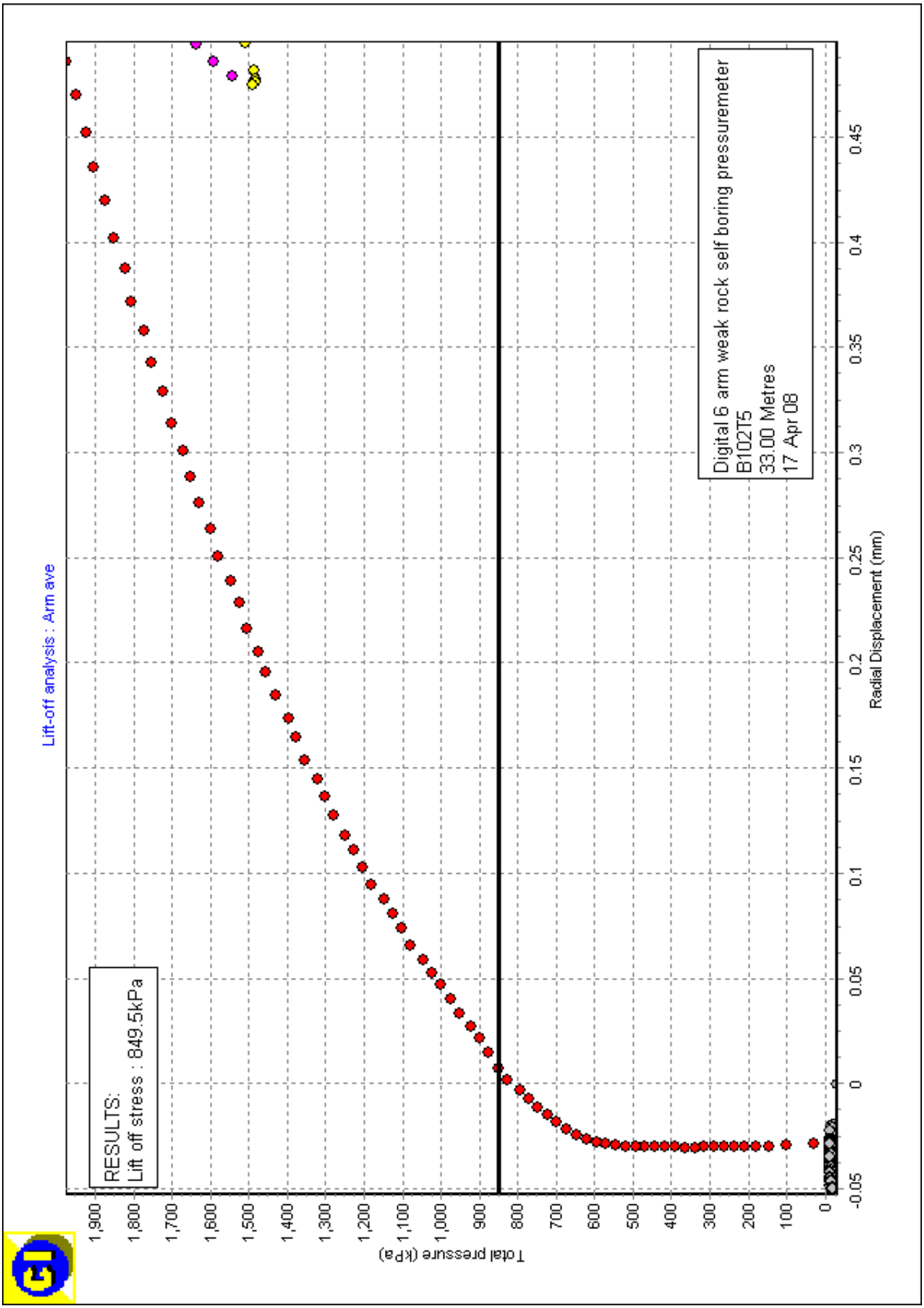
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	112.6	0.250	1759	0.489	552
Arm ave	2	96.0	2.253	2358	0.796	767

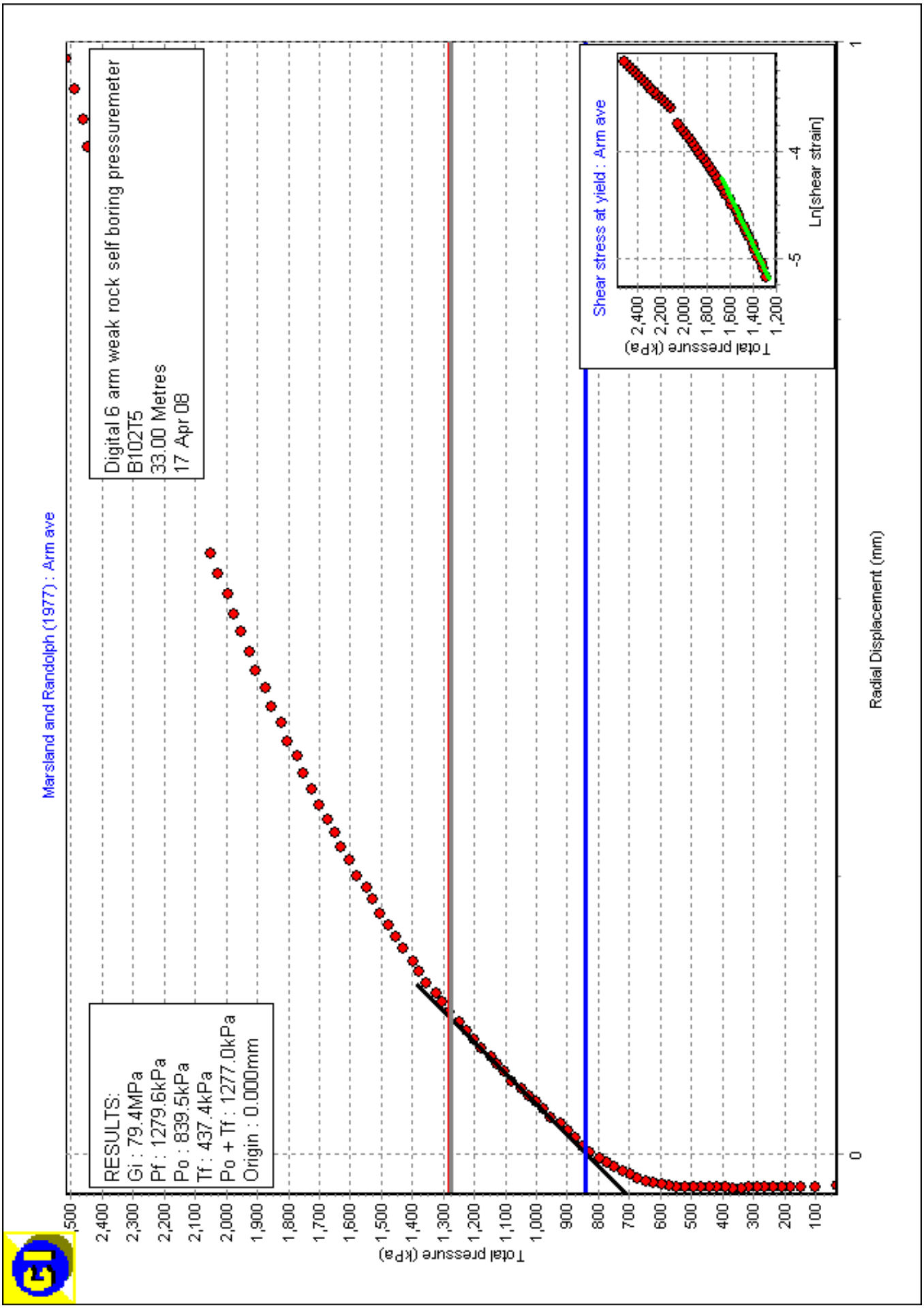
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

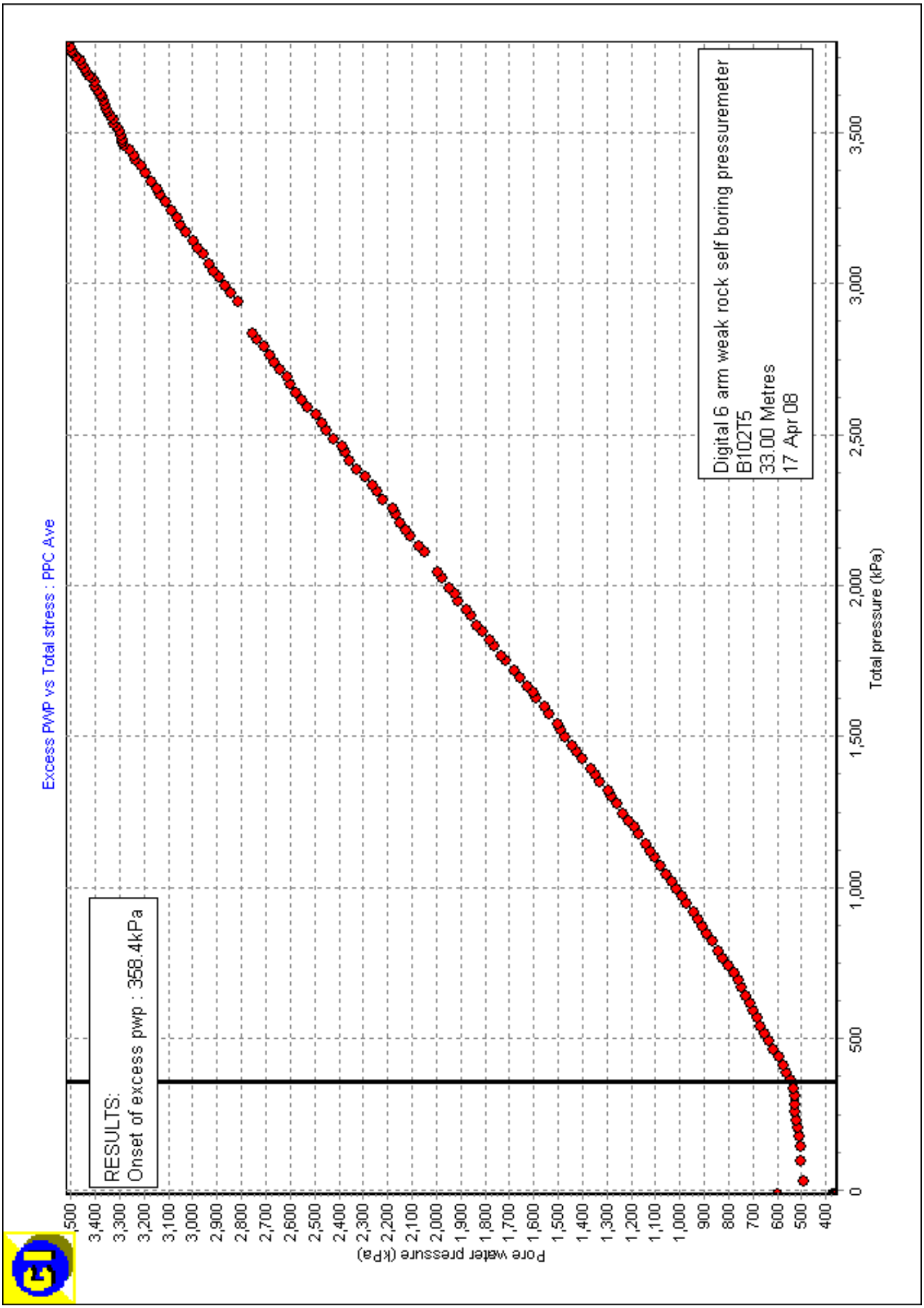
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	23.503	16.624	0.707
Arm ave	2	20.866	14.296	0.685

[PARAMETERS USED FOR UNDRAINED CURVE MODELLING]
Axis is Arm ave
Strain Origin (mm) : 0.42
Po (kPa) : 1006
Cu (kPa) : 664.7
Limit pressure (kPa) : 4962
Non-linear exponent : 0.685
Calculated alpha (MPa) : 14.424
G at yield (MPa) : 59.3


Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Total pressure (kPa)
Cavity strain (%)
0
200
400
600
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
-1
0
1
2
3
4
5
6
7
8


Lift-off analysis : Arm ave
RESULTS:
Lift off stress : 849.5kPa
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Total pressure (kPa)
Radial Displacement (mm)
1,900
1,800
1,700
1,600
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45


Marsland and Randolph (1977) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
RESULTS:
Gi : 79.4MPa
Pf : 1279.6kPa
Po : 839.5kPa
Tf : 437.4kPa
Po + Tf : 1277.0kPa
Origin : 0.000mm
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]


Excess PWP vs Total stress : PPC Ave
RESULTS:
Onset of excess pwp : 358.4kPa
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Pore water pressure (kPa)
Total pressure (kPa)
0
500
1,000
1,500
2,000
2,500
3,000
3,500
400
500
600
700
800
900
1,000
1,100
1,200
1,300
1,400
1,500
1,600
1,700
1,800
1,900
2,000
2,100
2,200
2,300
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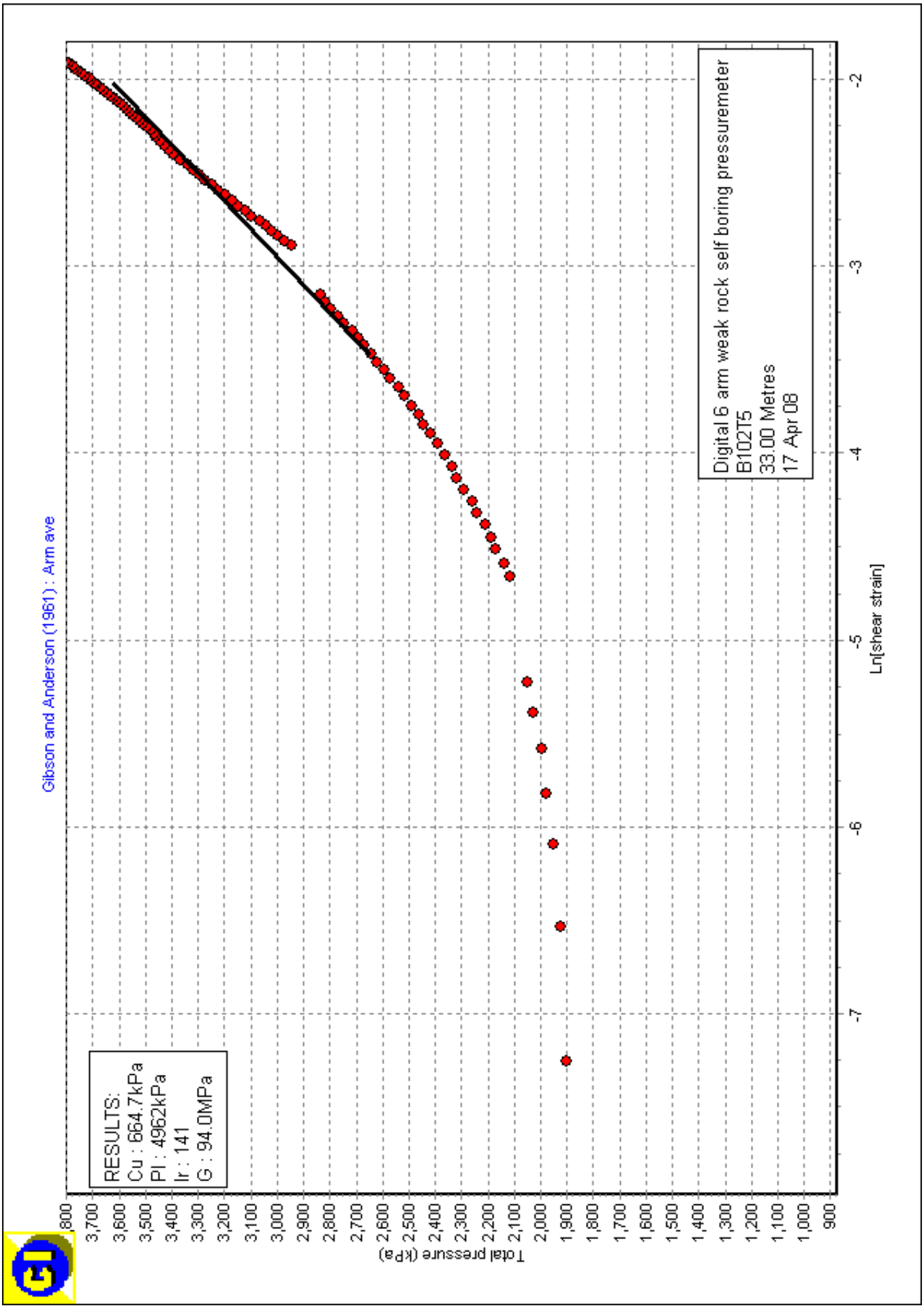
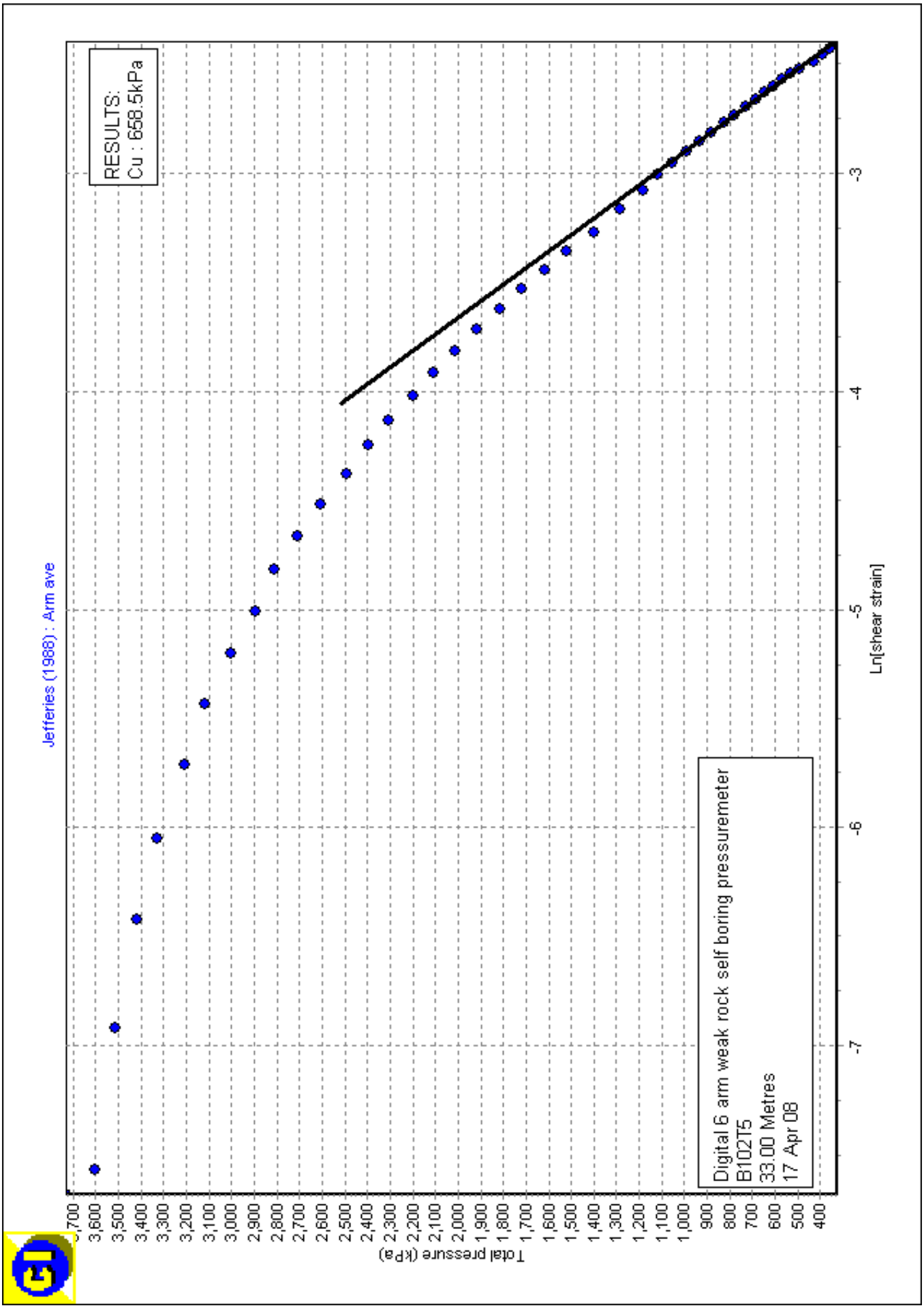
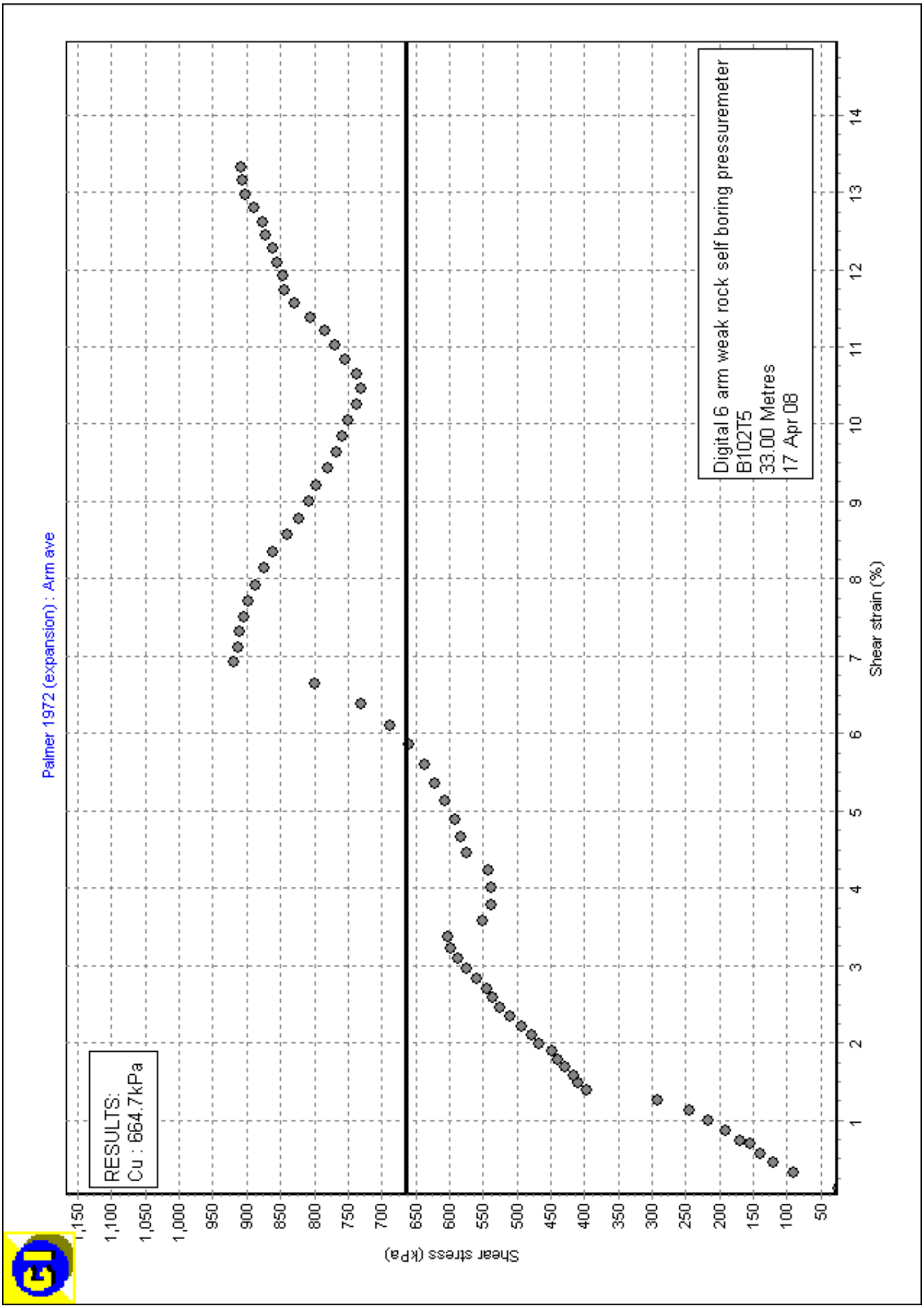
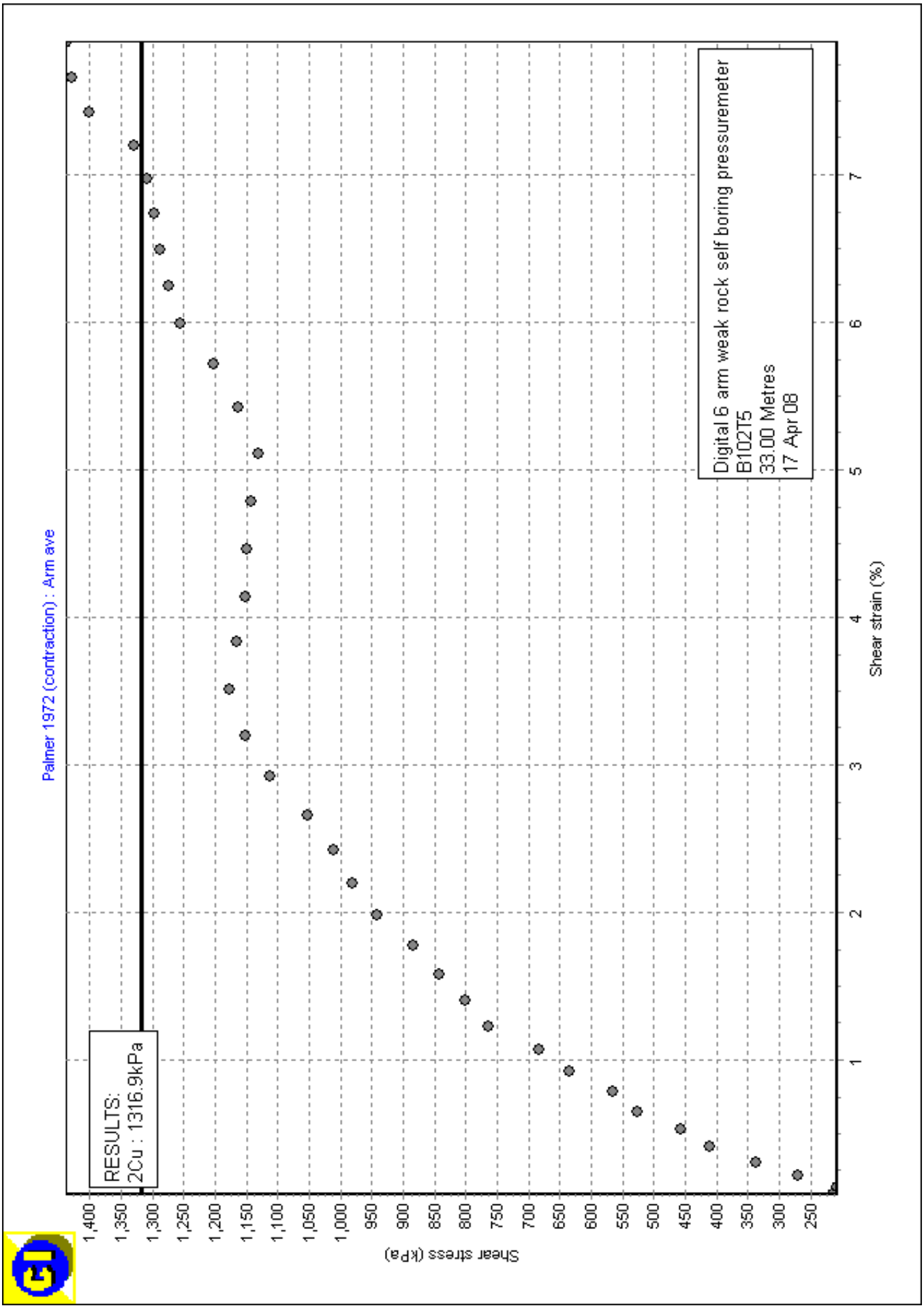
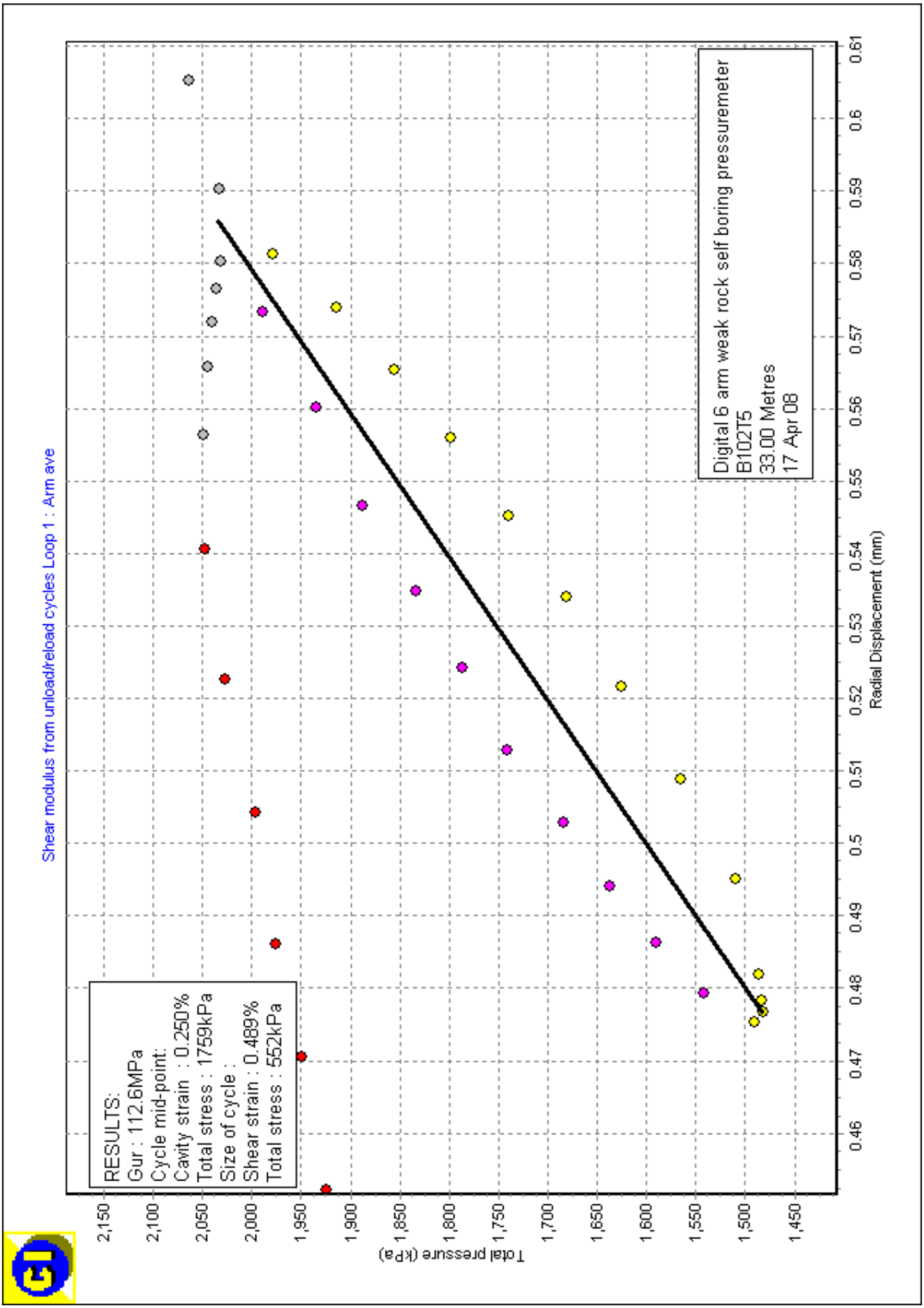
2,600
2,700
2,800
2,900
3,000
3,100
3,200
3,300
3,400

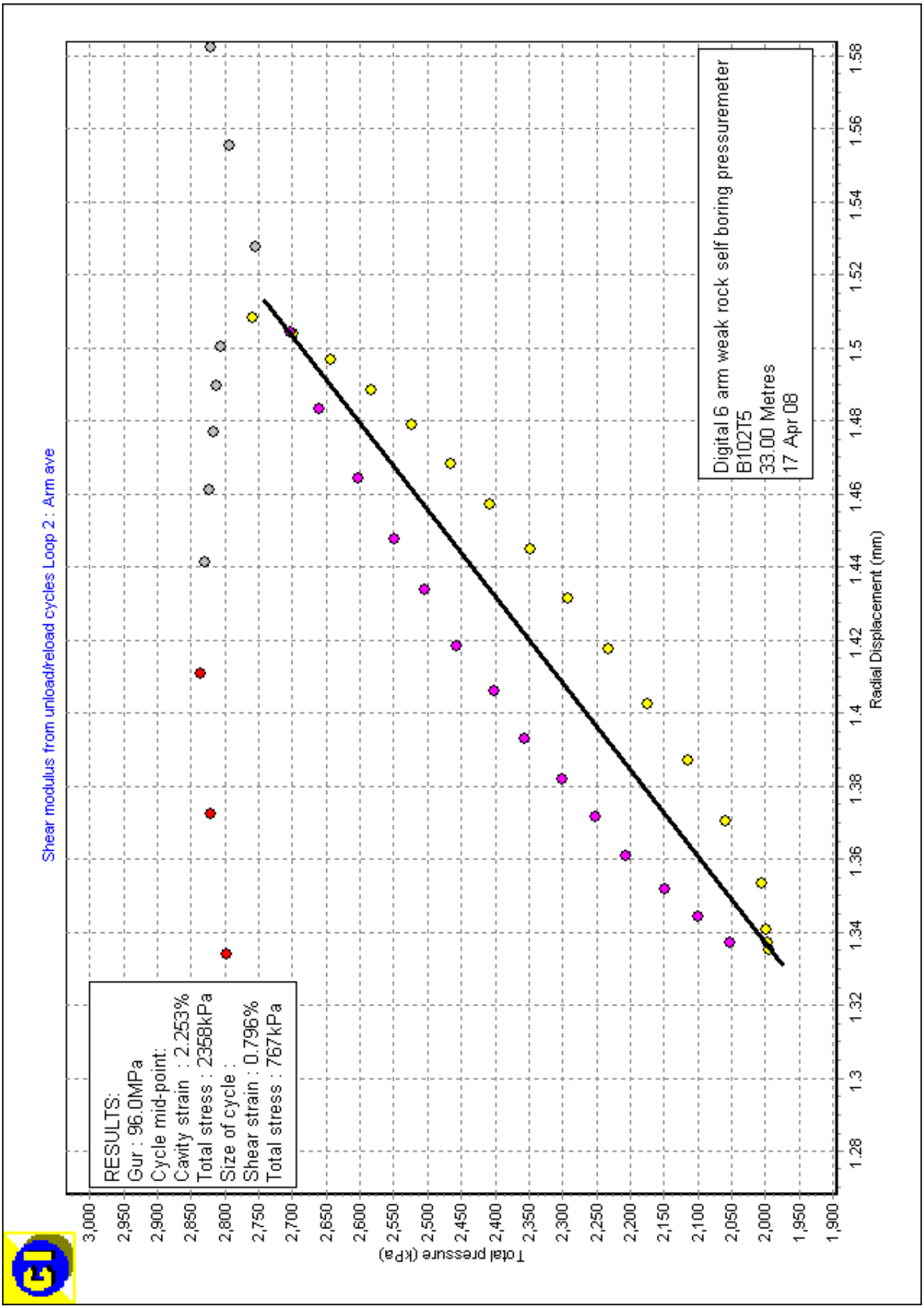

Gibson and Anderson (1961) : Arm ave
RESULTS:
Cu : 664.7kPa
PI : 4962kPa
Ir : 141
G : 94.0MPa
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Total pressure (kPa)
Ln[shear strain]

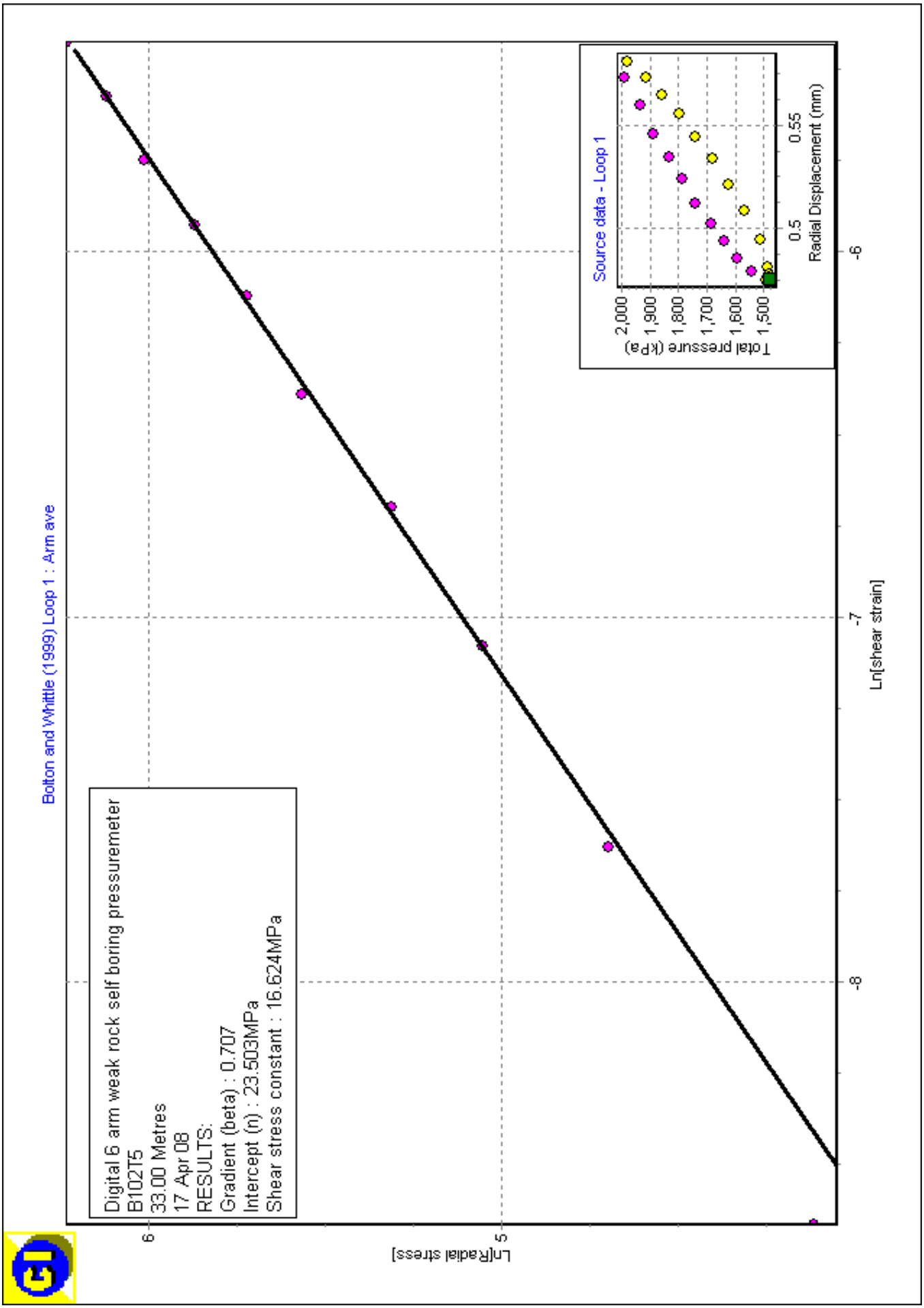

RESULTS:
Cu : 658.5kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Total pressure (kPa)
Ln[shear strain]

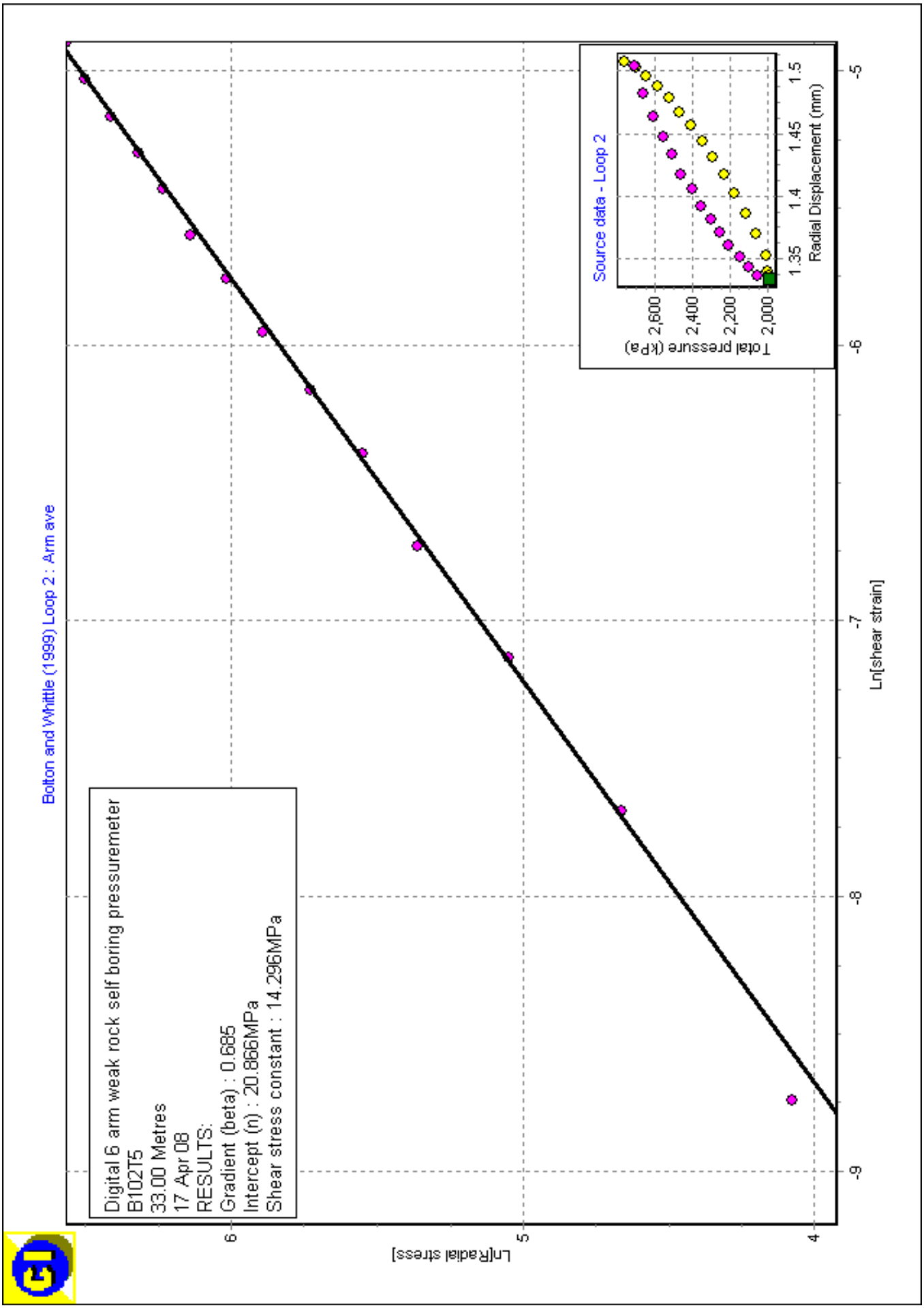

Palmer 1972 (expansion) : Arm ave
RESULTS:
Cu : 664.7kPa
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Shear stress (kPa)
Shear strain (%)

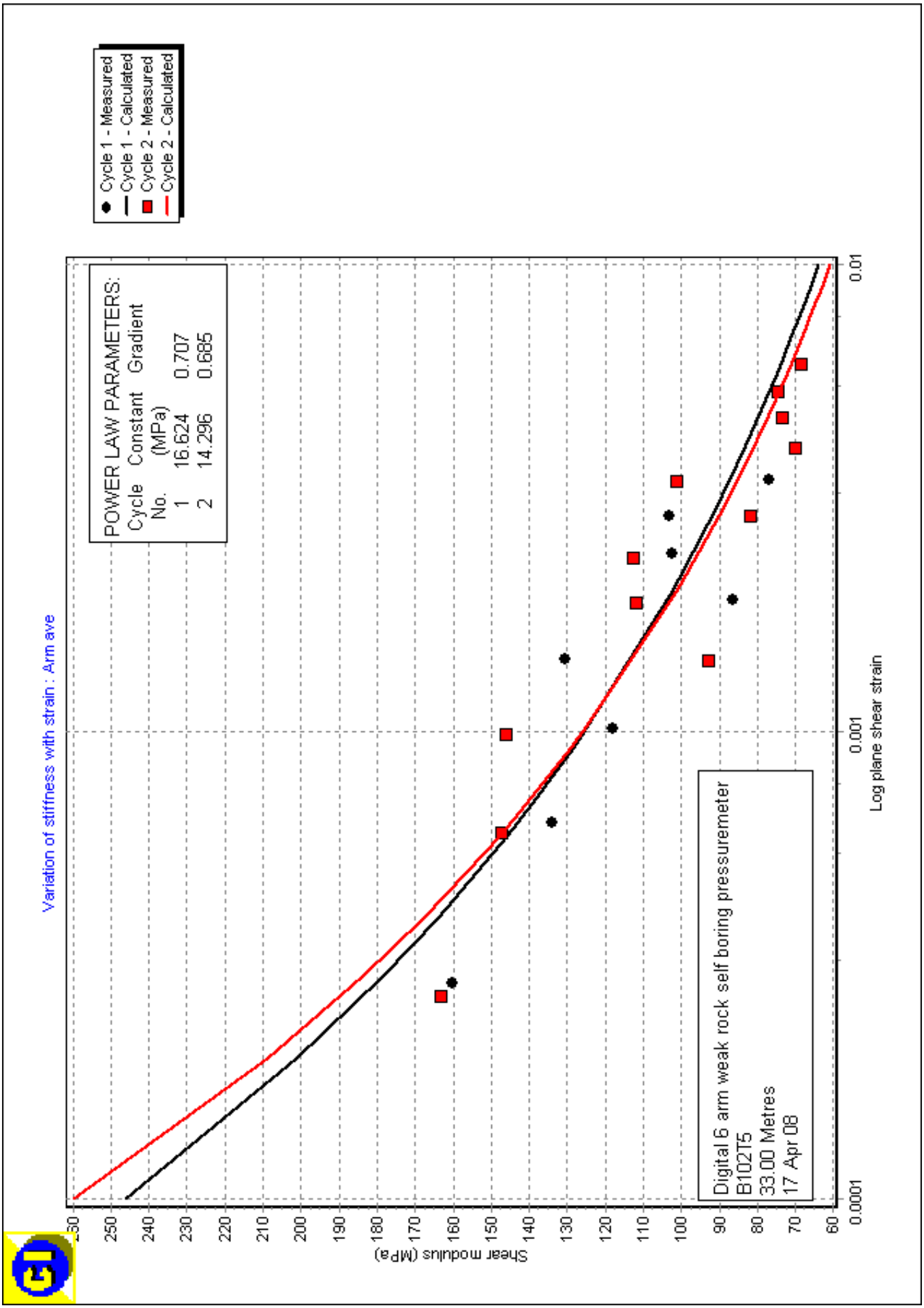

Palmer 1972 (contraction) : Arm ave
RESULTS:
2Cu : 1316.9kPa
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Shear stress (kPa)
Shear strain (%)

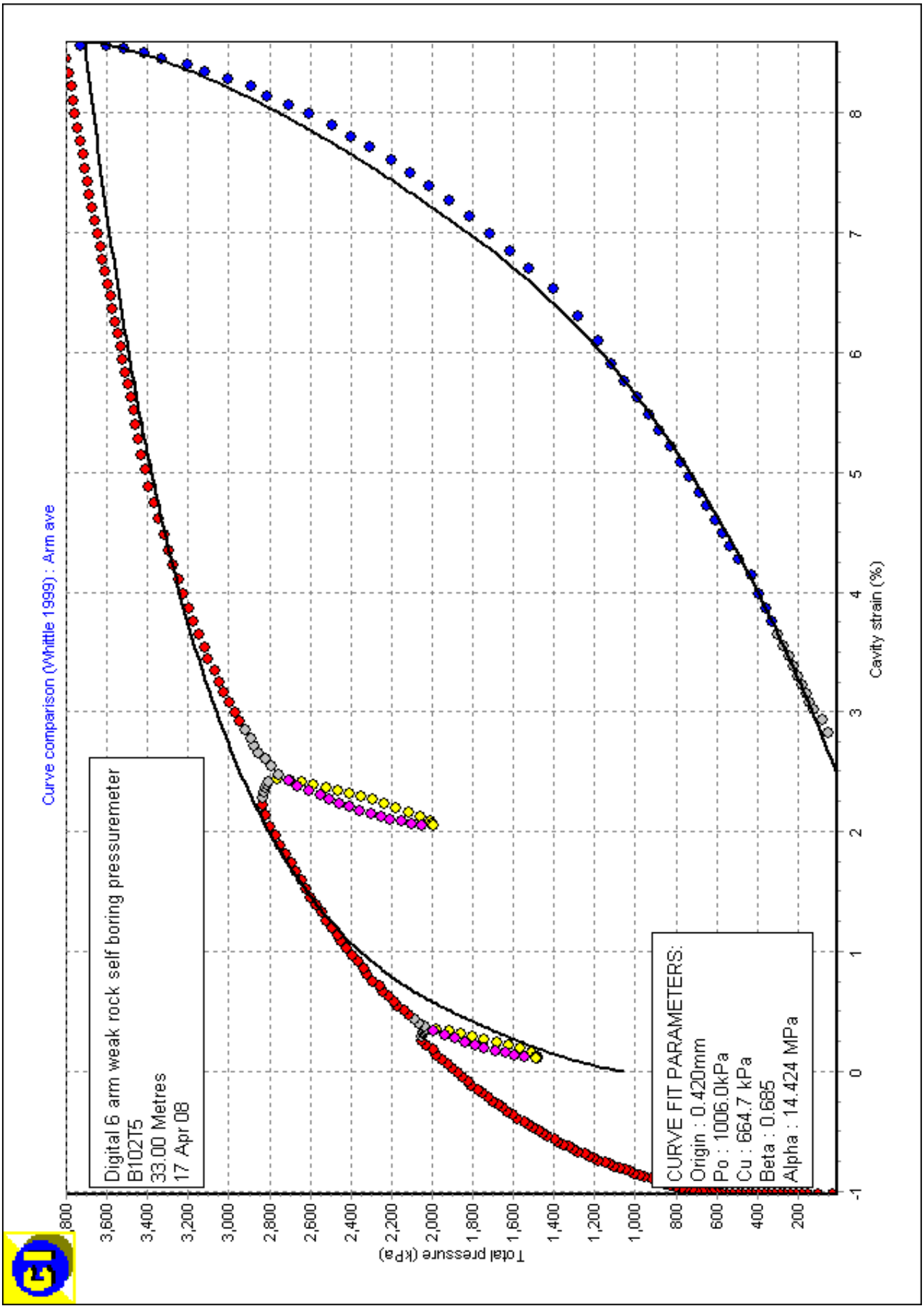

Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 112.6MPa
Cycle mid-point:
Cavity strain : 0.250%
Total stress : 1759kPa
Size of cycle :
Shear strain : 0.489%
Total stress : 552kPa
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Total pressure (kPa)
Radial Displacement (mm)
2,150
2,100
2,050
2,000
1,950
1,900
1,850
1,800
1,750
1,700
1,650
1,600
1,550
1,500
1,450
0.46
0.47
0.48
0.49
0.5
0.51
0.52
0.53
0.54
0.55
0.56
0.57
0.58
0.59
0.6
0.61


Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 96.0MPa
Cycle mid-point:
Cavity strain : 2.253%
Total stress : 2358kPa
Size of cycle :
Shear strain : 0.796%
Total stress : 767kPa
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
RESULTS:
Gradient (beta) : 0.707
Intercept (n) : 23.503MPa
Shear stress constant : 16.624MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 1
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 2 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
RESULTS:
Gradient (beta) : 0.685
Intercept (n) : 20.866MPa
Shear stress constant : 14.296MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)


Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
POWER LAW PARAMETERS:
Cycle No. Constant (MPa) Gradient
1 16.624 0.707
2 14.296 0.685
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
0.0001
0.001
0.01
Digital 6 arm weak rock self boring pressuremeter
B1027S
33.00 Metres
17 Apr 08


Curve comparison (Whittle 1999) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T5
33.00 Metres
17 Apr 08
CURVE FIT PARAMETERS:
Origin : 0.420mm
Po : 1006.0kPa
Cu : 664.7 kPa
Beta : 0.685
Alpha : 14.424 MPa
Total pressure (kPa)
Cavity strain (%)

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
Dunmarle Road	17/4/08	THUR	B102	5	33m

Weather:- Fine Material:- LAMBETH GROUP - RUBBISH/GREY CLAY

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
?	11:55	12:35	1m	1m/40min	@ 130 BARS

Ground level :- Orientation:-

Water Press./	Inst.OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
300 Ri	88.1	89.1	73 RR	4mm	Mon 1

Drilling Remarks:- DIFFICULT - PRESS BACK SEVERAL TIMES.

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
1%/min	4(4)	65s	150 Bar.	12.45	TRIG	10MPa.

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-110	80	-61	-33	-83	130	-1022	-916	-2453	Ground Level Zeros
									Pre-drilling Zeros
-112	71	-75	81	91	119	-908	-796	-2441	Post-drilling Zeros
									Pre-test Zeros
									Ground Level Zeros

Test starts:- 12:38

Line	Notes
711	Hold 2.1MPa.
716	Loop 1 PR5 — Back to PRA at end of loop.
771	Hold 2.45MPa
798	Loop 2 PR5
834	PR3
864	unload

Test ends:- 13:07 Max Press:- 3801 kPa.

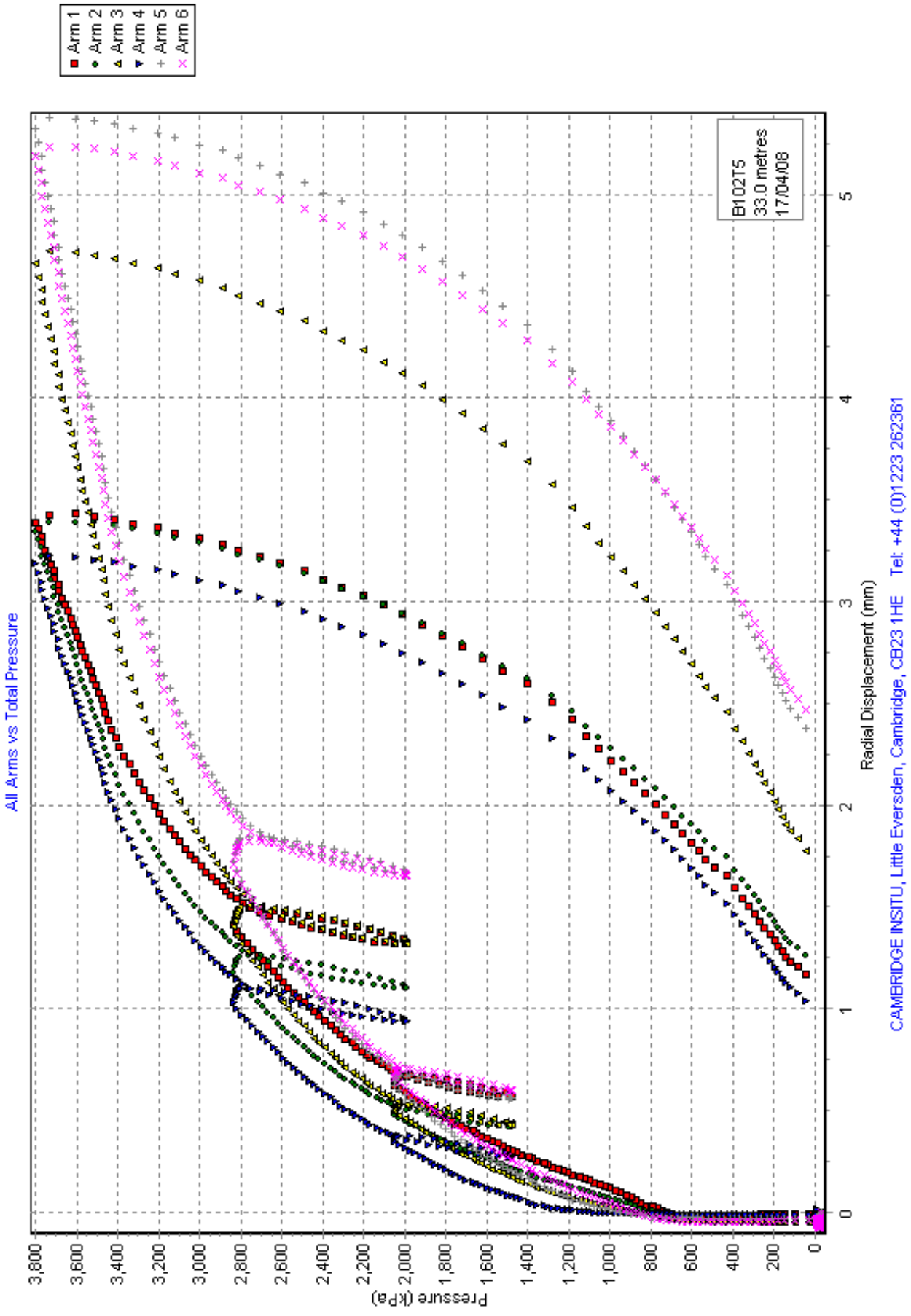
Calibrated Data details:

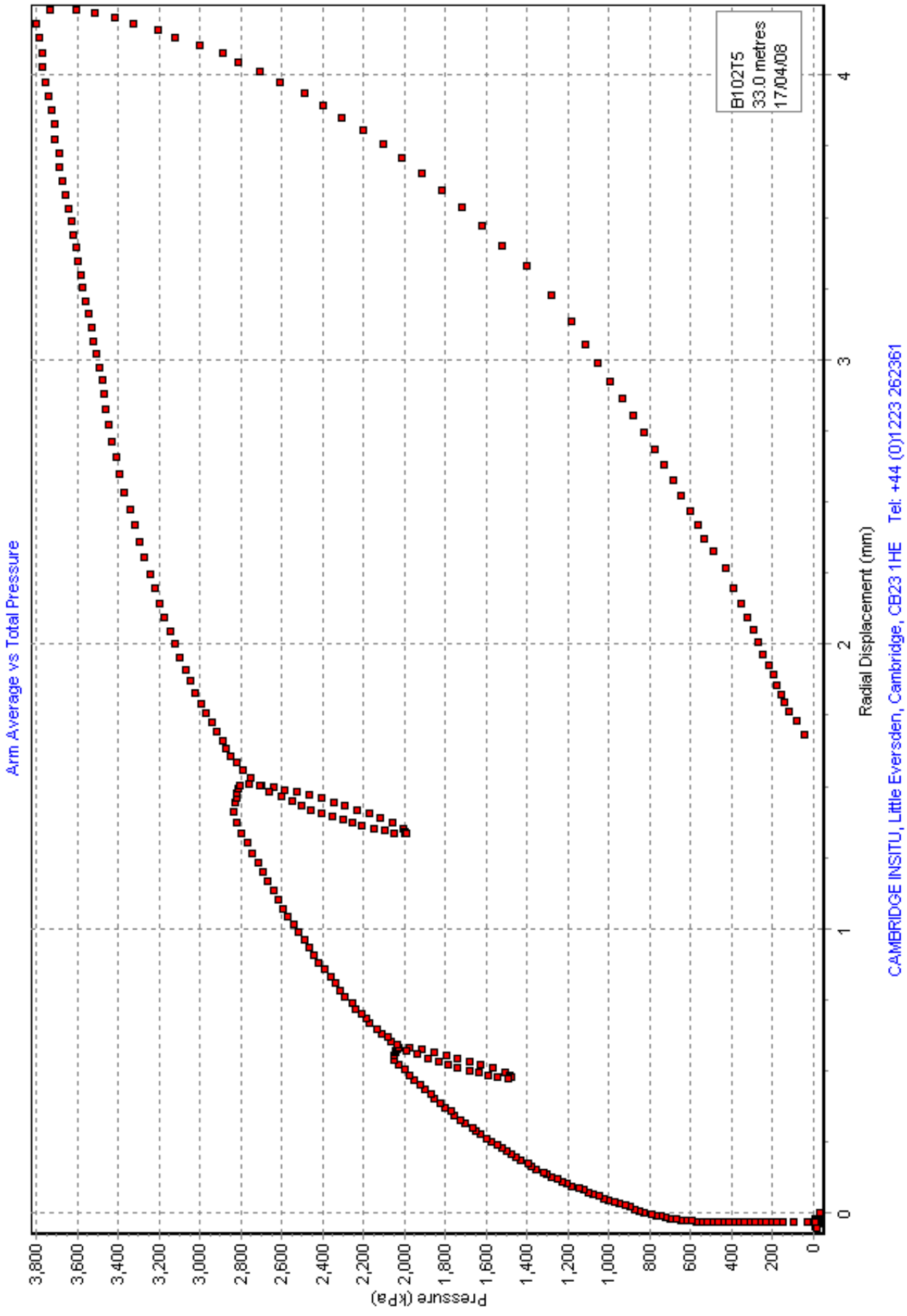
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
W0130T1	W0130T2	10/4/08	11/4/08

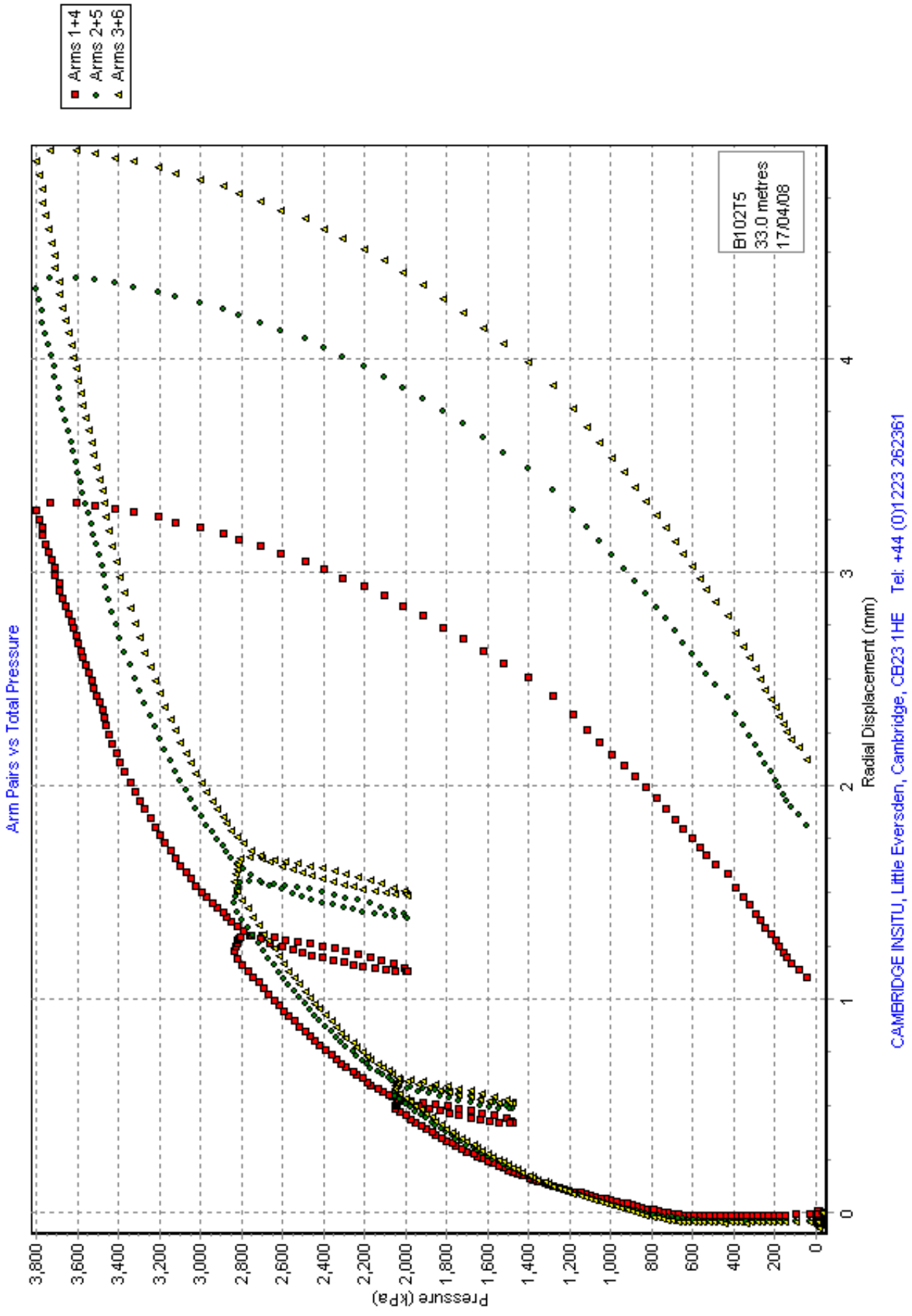
TEST REMARKS: V. Good PMP response, strain hardening loading.

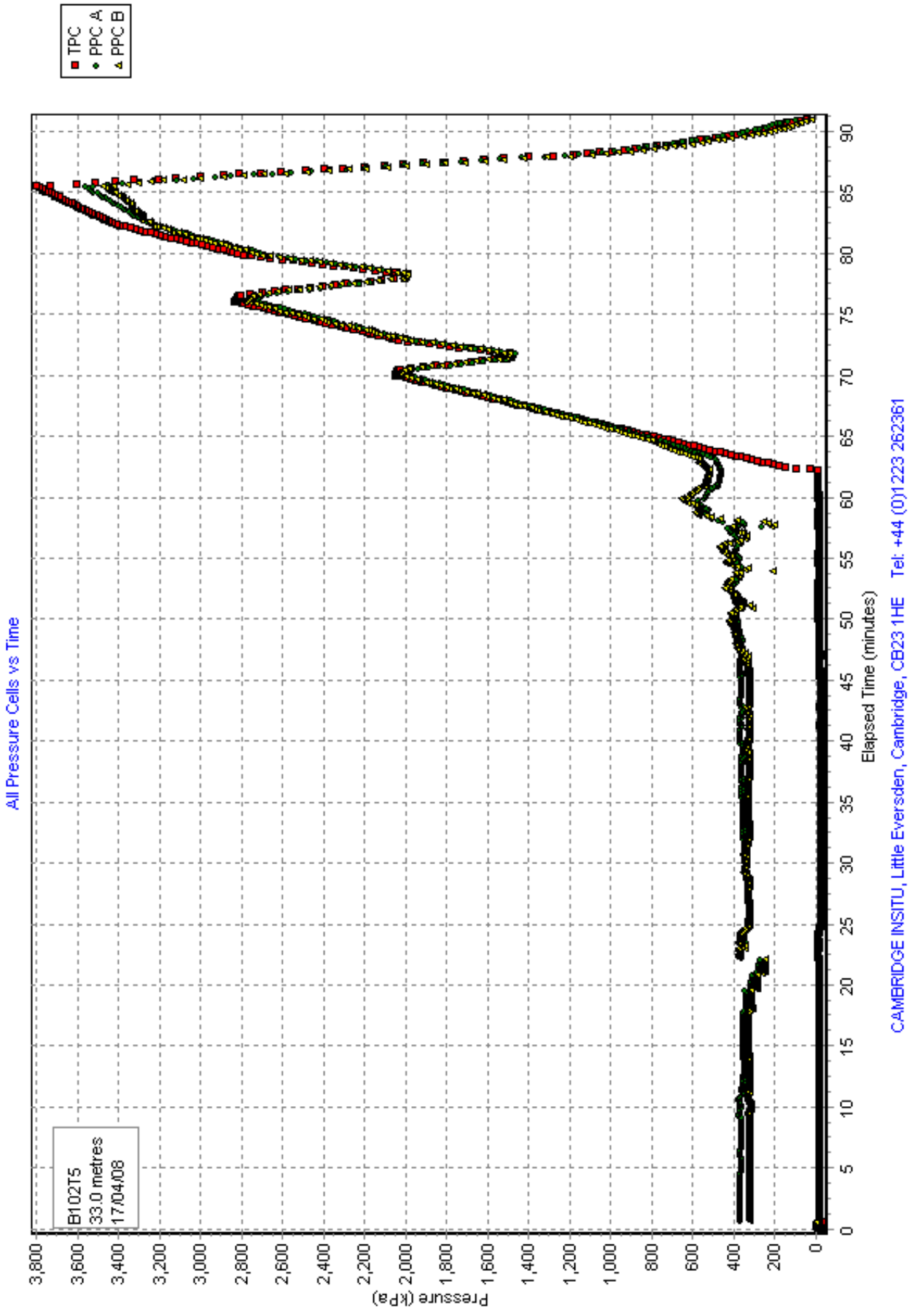
Driller: DAN

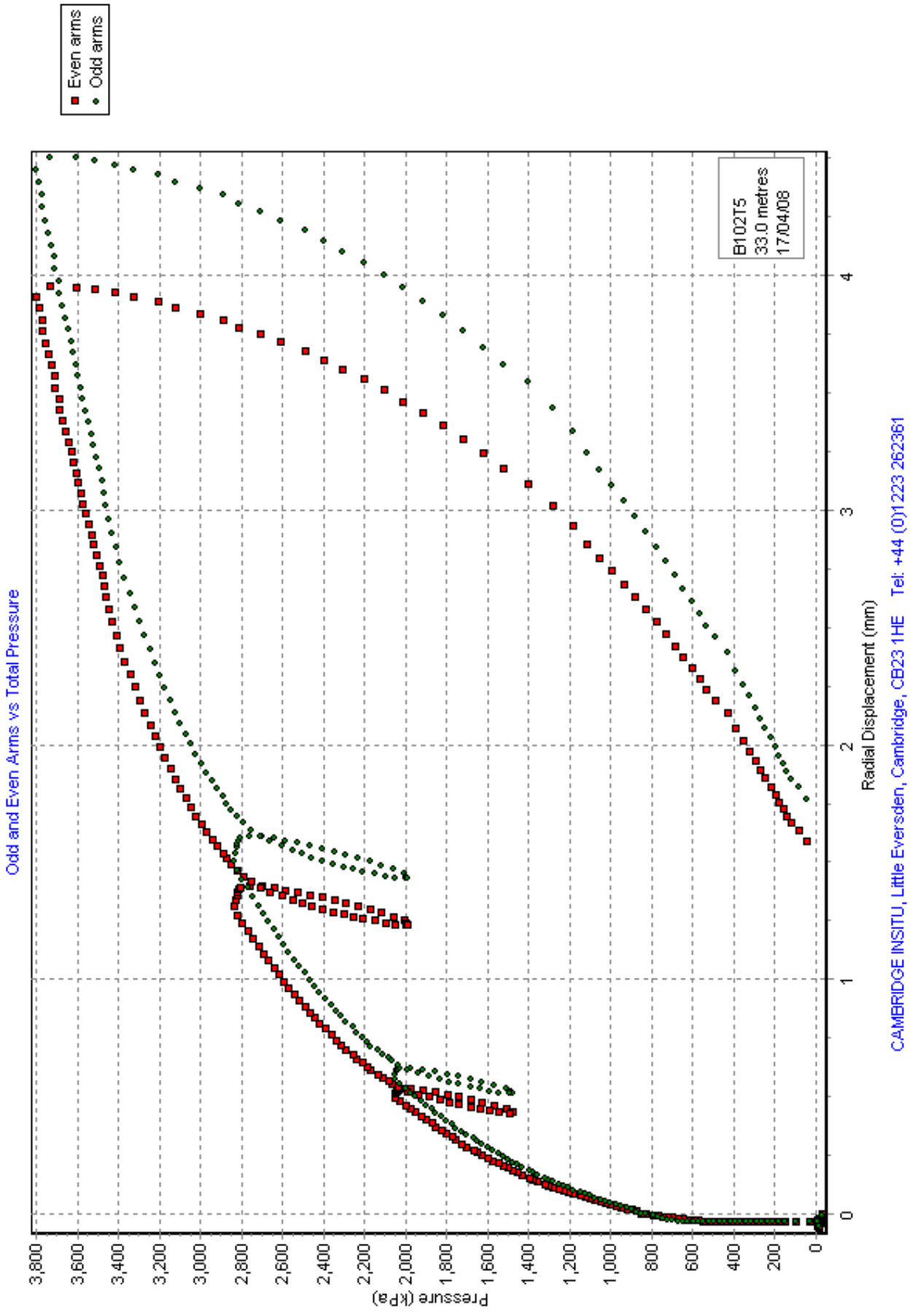
Tester: RW.


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
B102T5
33.0 metres
17/04/08
All Arms vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
B102T5
33.0 metres
17/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arms 1+4
Arms 2+5
Arms 3+6
Arm Pairs vs Total Pressure
B102T5
33.0 metres
17/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


TPC
PPC A
PPC B
All Pressure Cells vs Time
B102T5
33.0 metres
17/04/08
Pressure (kPa)
Elapsed Time (minutes)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T5
33.0 metres
17/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361

B102T6 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]

Project	:	36237
Site	:	Denmark Place
Borehole	:	BH102
Test name	:	B102T6
Test date	:	18 Apr 08
Test depth	:	43.00 Metres
Water table	:	5.6 Metres
Ambient PWP	:	366.9 kPa
Material	:	Lambeth Group - clay/sand
Probe	:	Digital 6 arm weak rock self boring pressuremeter
Diameter	:	88.1 mm

Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out
The file includes results from a curve fitting analysis

Analysed by RWW on 18 Apr 08

Remarks:

[RESULTS FOR CAVITY REFERENCE PRESSURE]

Strain Origin (mm)	:	"Arm ave=0.054"
Po from Marsland & Randolph (kPa)	:	"Arm ave=976.0"
Po from Lift off (kPa)	:	"Arm ave=1017.3"
PWP versus Total Stress (kPa)	:	"PPC Ave=310.3"
Best estimate of Po (kPa)	:	"Arm ave=1017.0"

[UNDRAINED STRENGTH PARAMETERS]

Gibson & Anderson 1961 - Cu (kPa)	:	"Arm ave=1748.7"
Limit pressure (kPa)	:	"Arm ave=9854"
Jefferies 1988 - Cu (kPa)	:	"Arm ave=1047.3"
Undrained yield stress (kPa)	:	"Arm ave=2218.9"

[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=115.1"

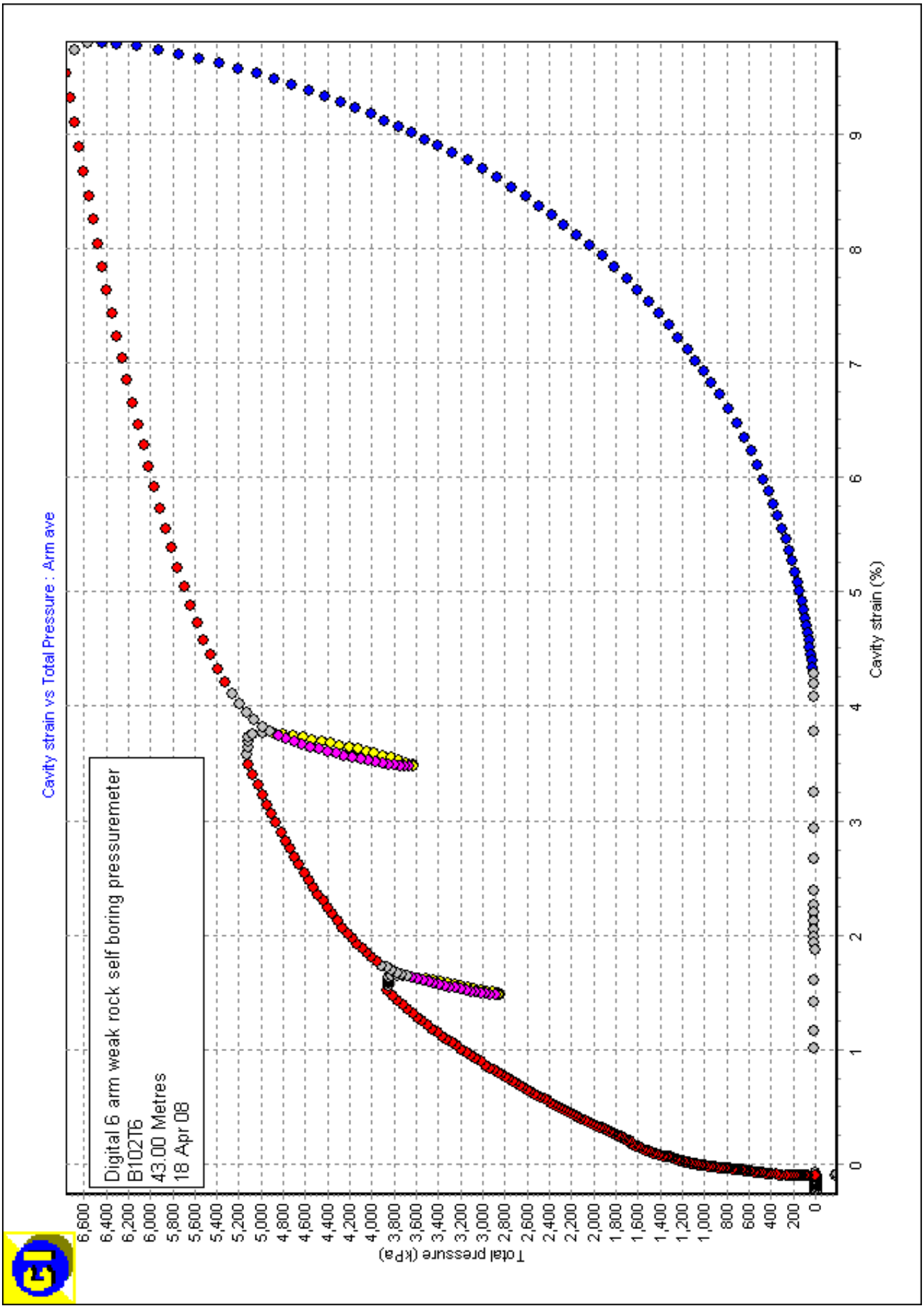
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	261.8	1.569	3258	0.325	852
Arm ave	2	231.2	3.632	4269	0.571	1324

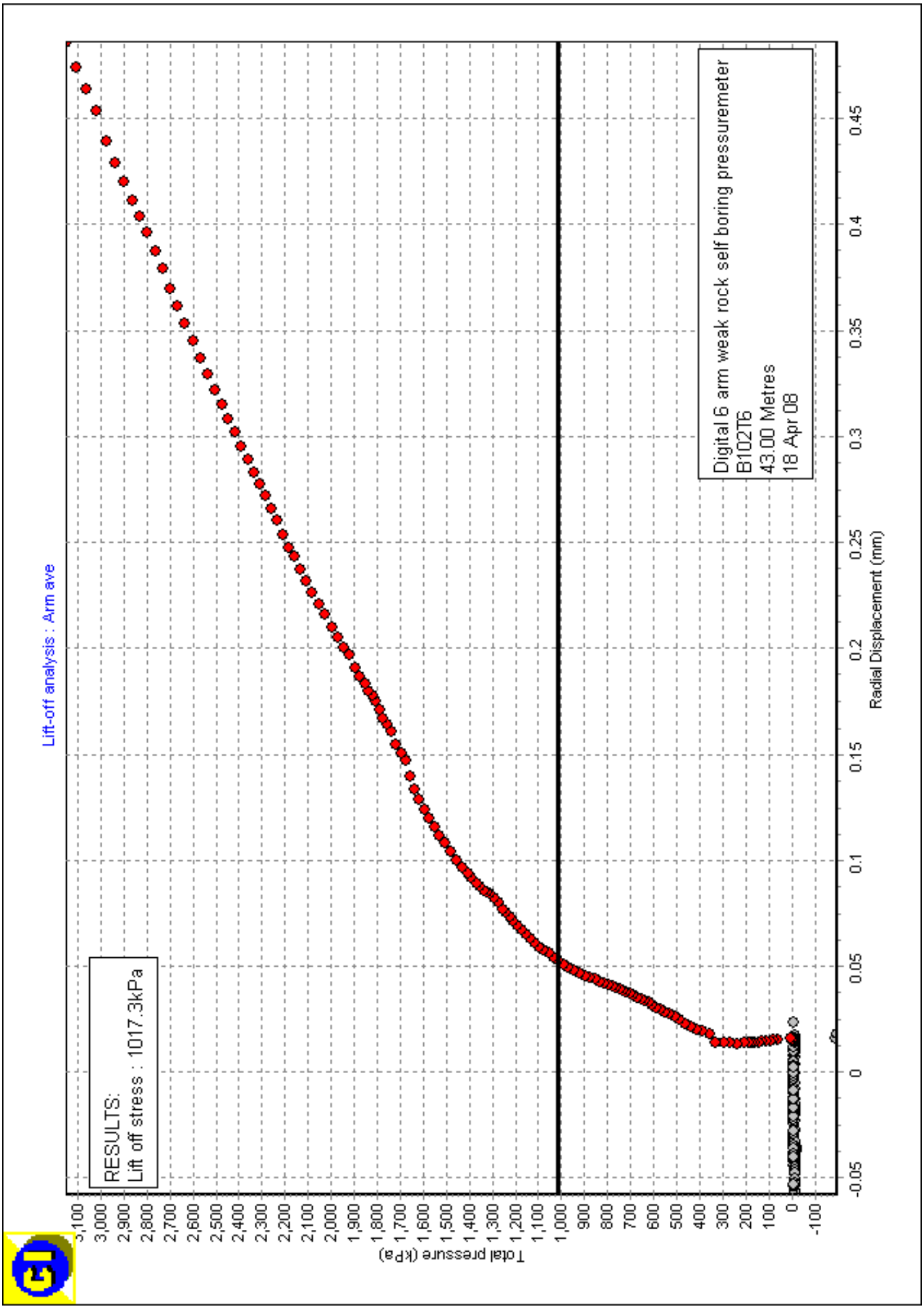
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

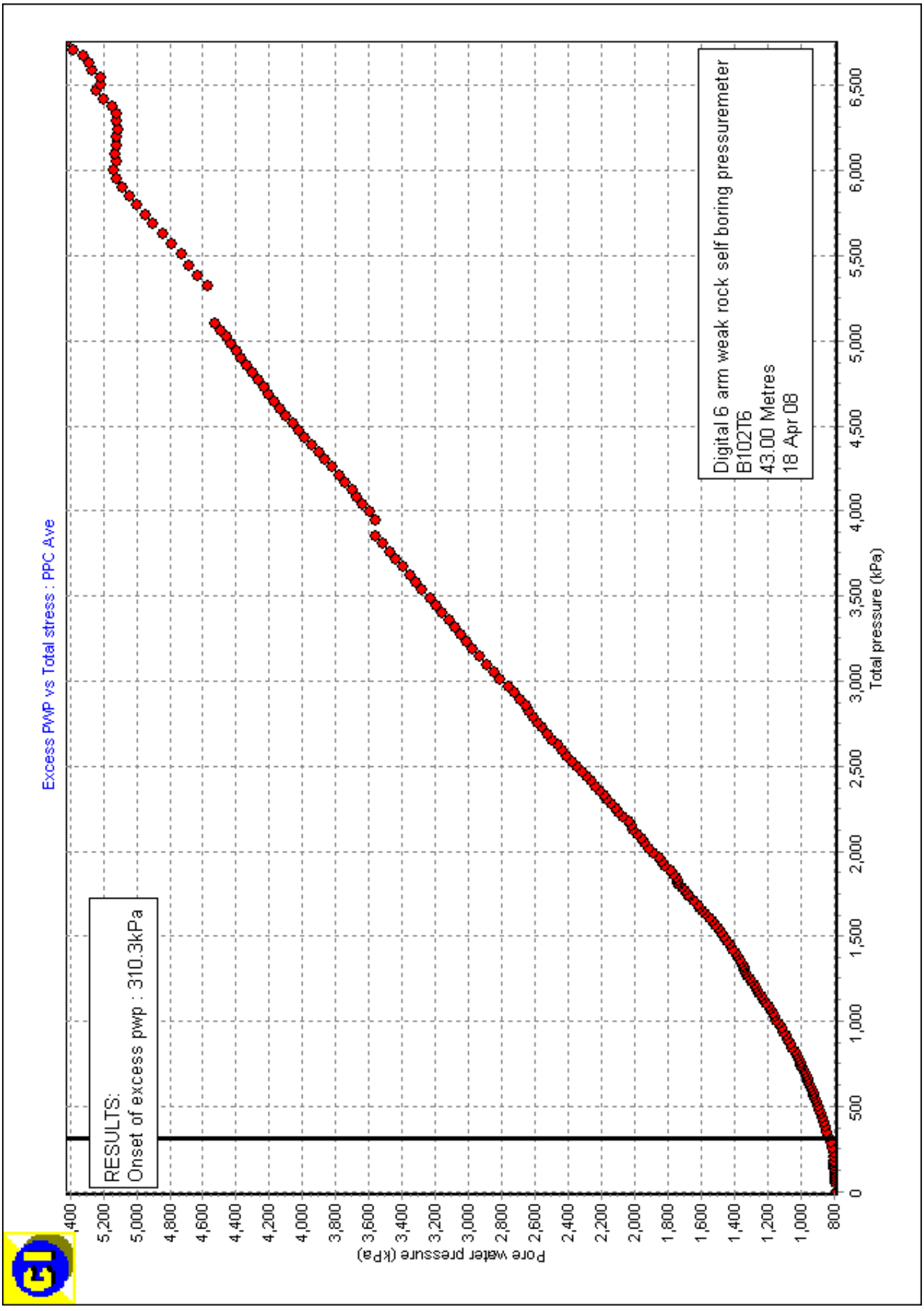
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	57.681	42.590	0.738
Arm ave	2	55.721	39.838	0.715

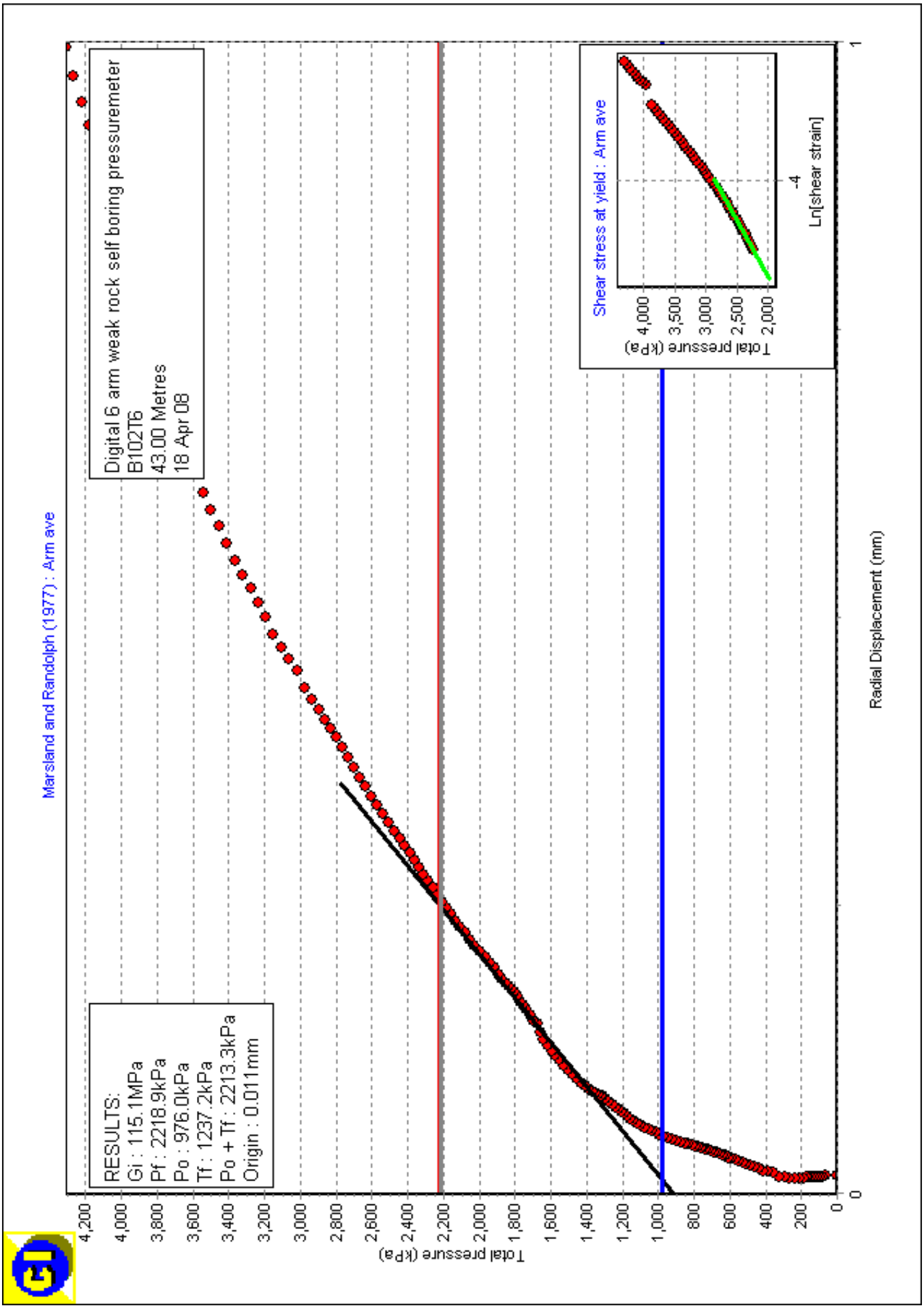
[PARAMETERS USED FOR UNDRAINED CURVE MODELLING]
Axis is Arm ave

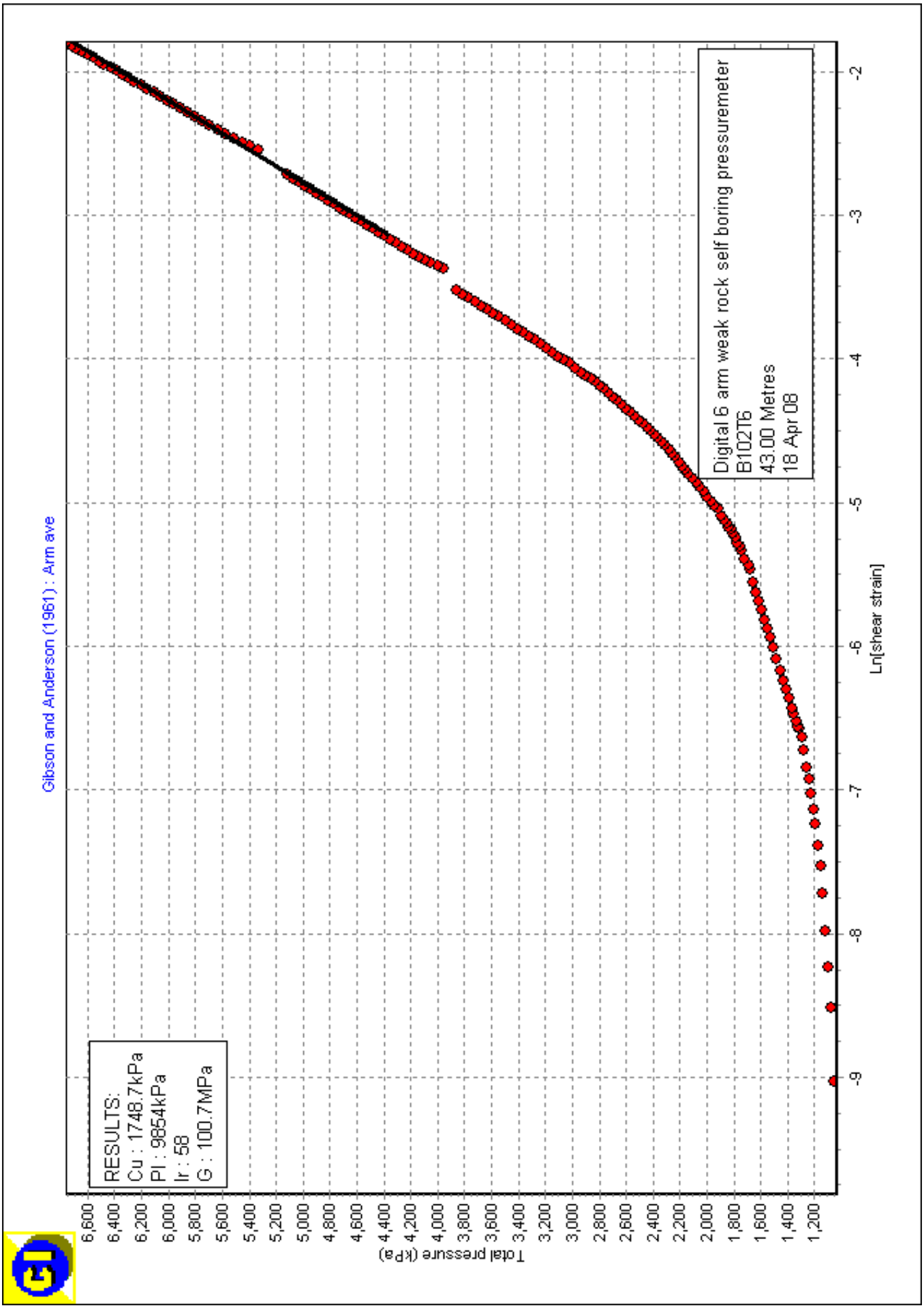
Strain Origin (mm)	:	0.45
Po (kPa)	:	1502
Cu (kPa)	:	1082.6
Limit pressure (kPa)	:	8366
Non-linear exponent	:	0.715
Calculated alpha (MPa)	:	37.064
G at yield (MPa)	:	151.6

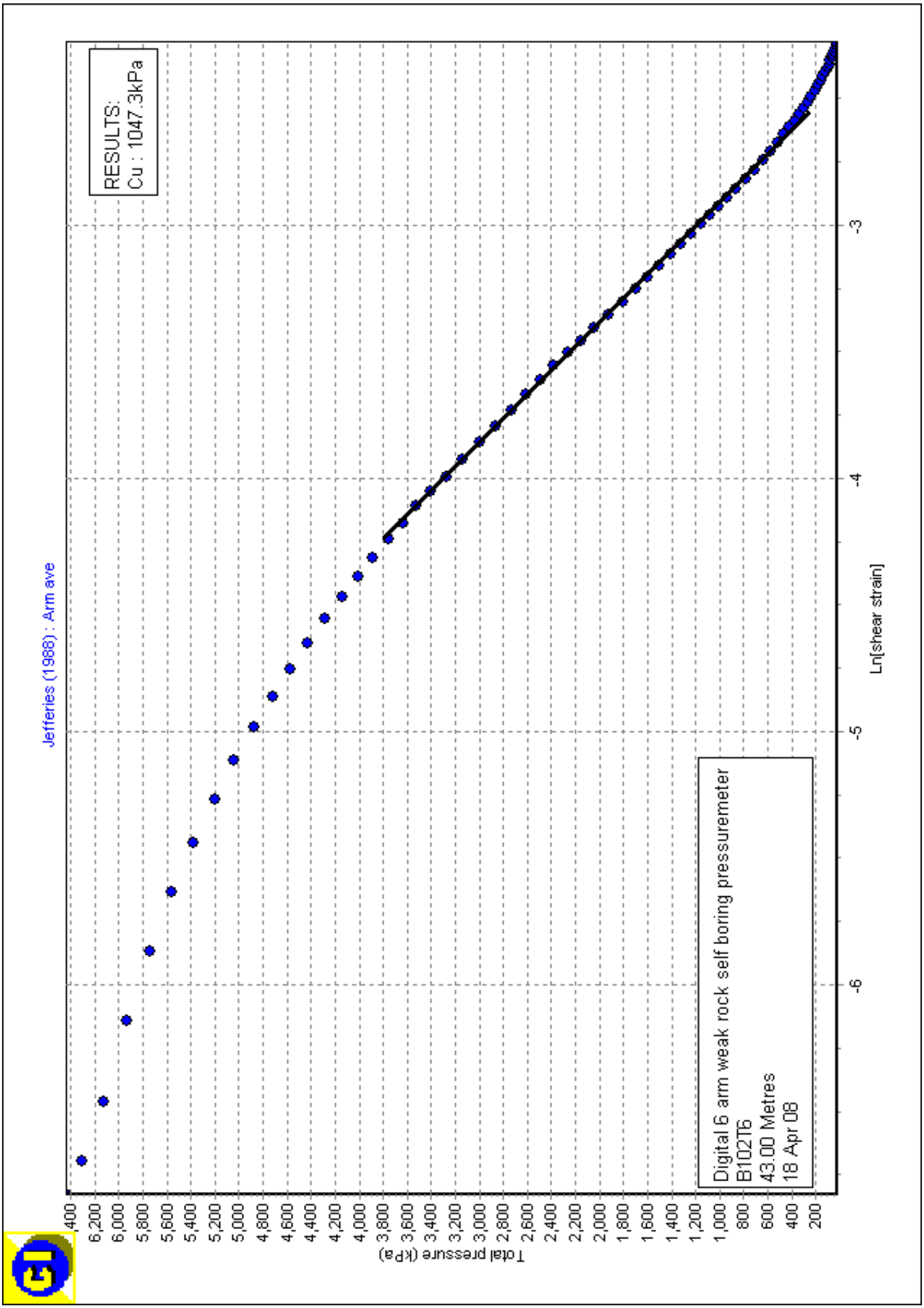

Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Total pressure (kPa)
Cavity strain (%)

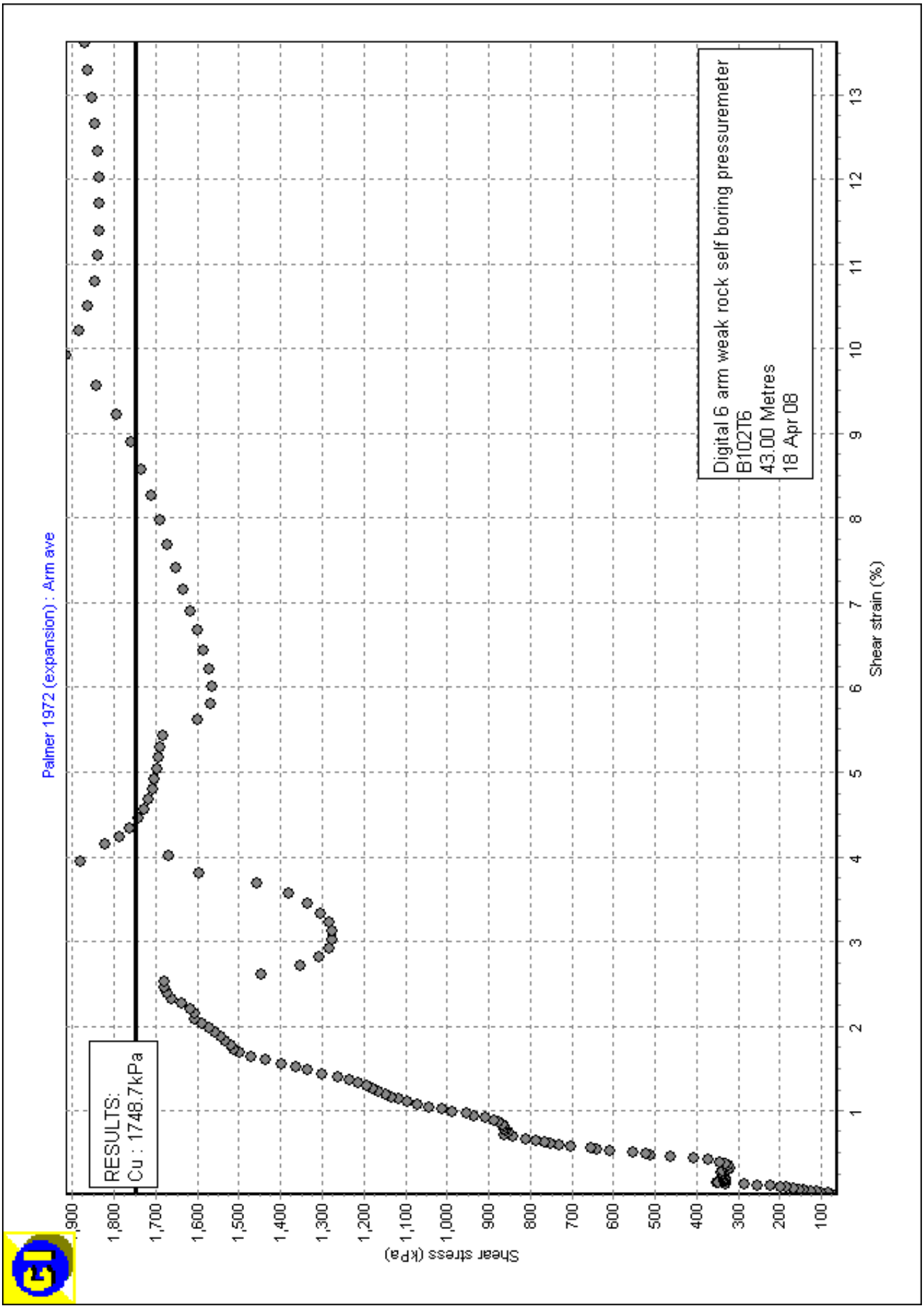

Lift-off analysis : Arm ave
RESULTS:
Lift off stress : 1017.3kPa
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Total pressure (kPa)
Radial Displacement (mm)

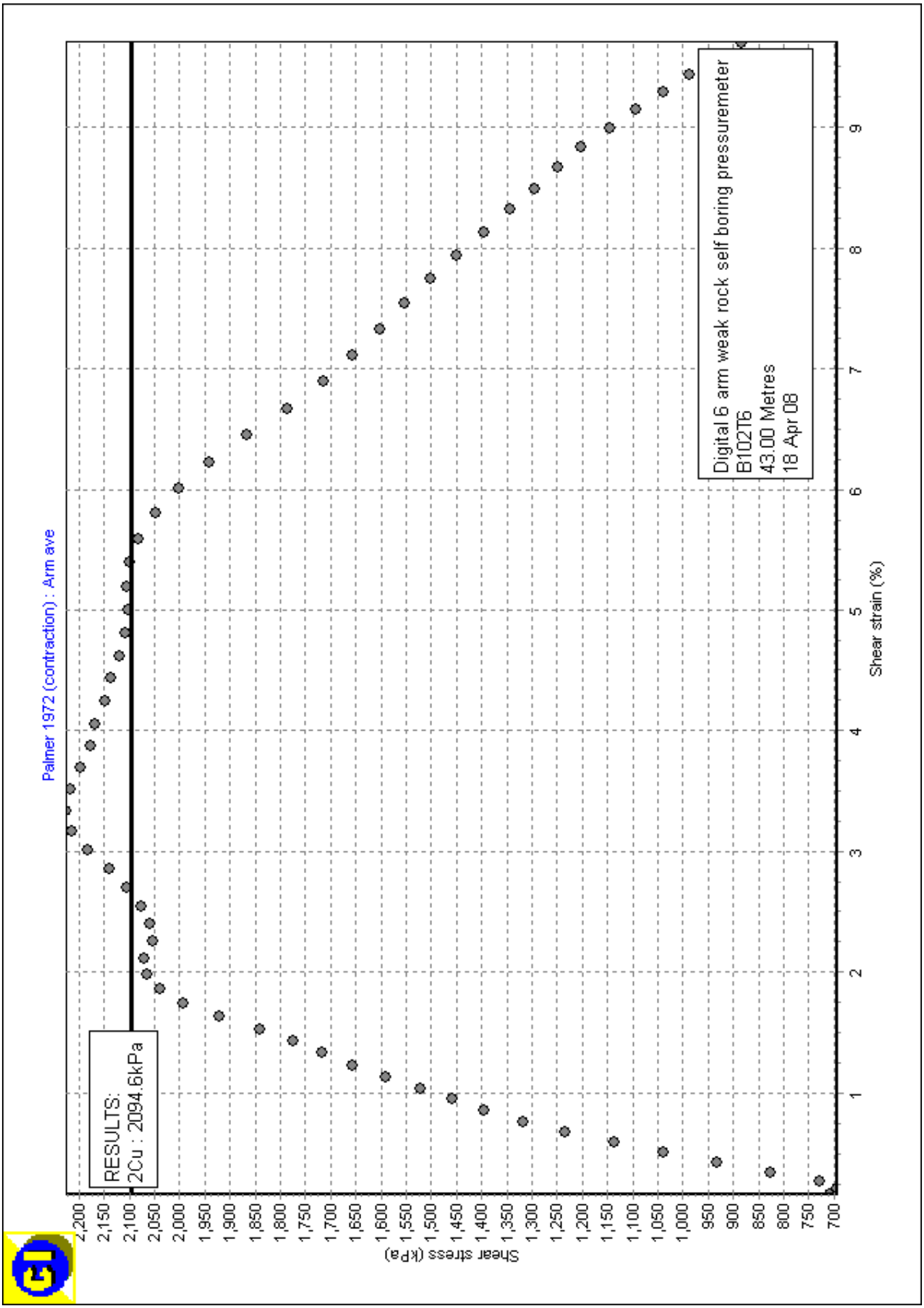

Excess PWP vs Total stress : PPC Ave
RESULTS:
Onset of excess pwp : 310.3kPa
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Pore water pressure (kPa)
Total pressure (kPa)
800
1,000
1,200
1,400
1,600
1,800
2,000
2,200
2,400
2,600
2,800
3,000
3,200
3,400
3,600
3,800
4,000
4,200
4,400
4,600
4,800
5,000
5,200
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500

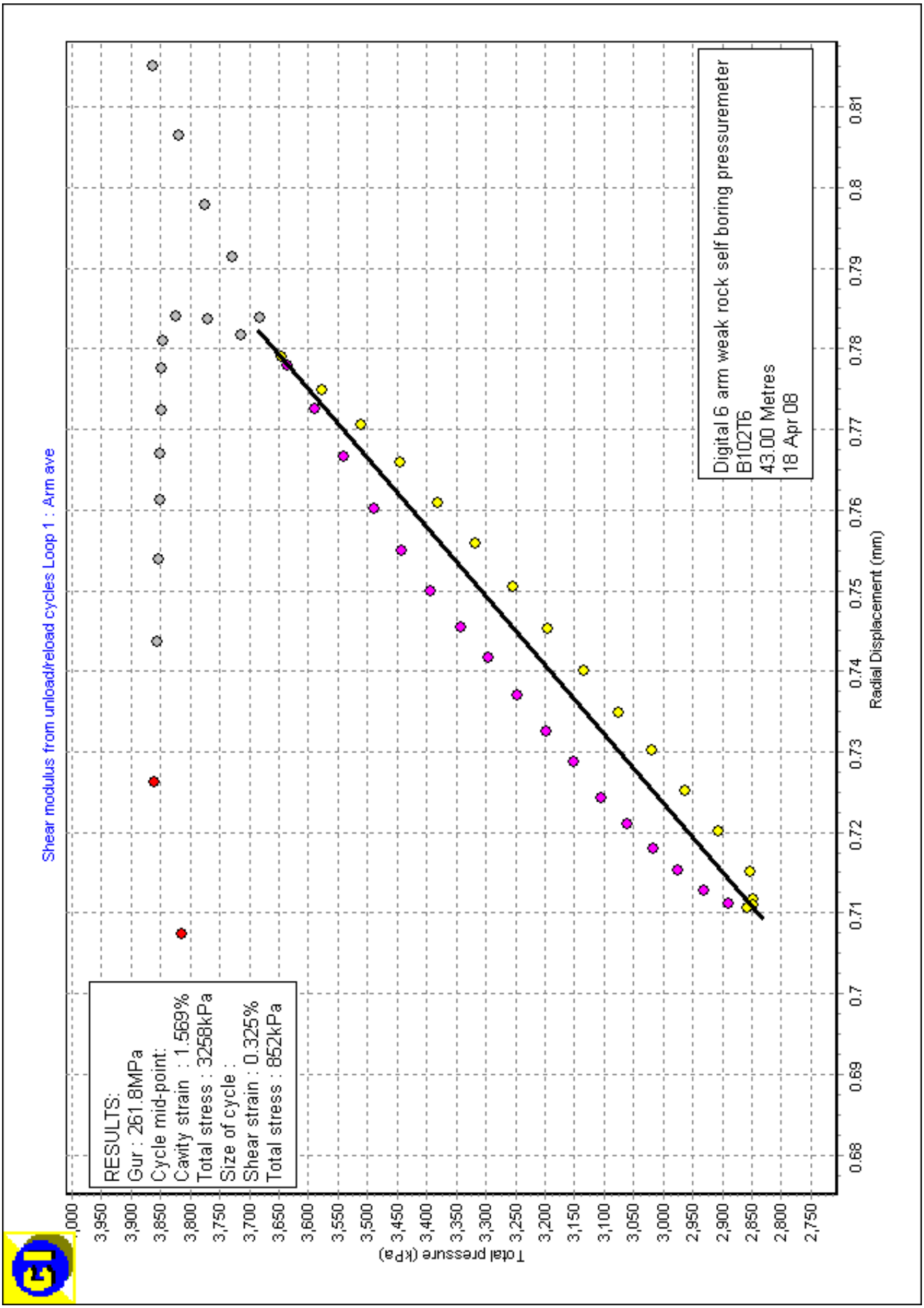

Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
RESULTS:
Gi : 115.1MPa
Pf : 2218.9kPa
Po : 976.0kPa
Tf : 1237.2kPa
Po + Tf : 2213.3kPa
Origin : 0.011mm
Marsland and Randolph (1977) : Arm ave
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]

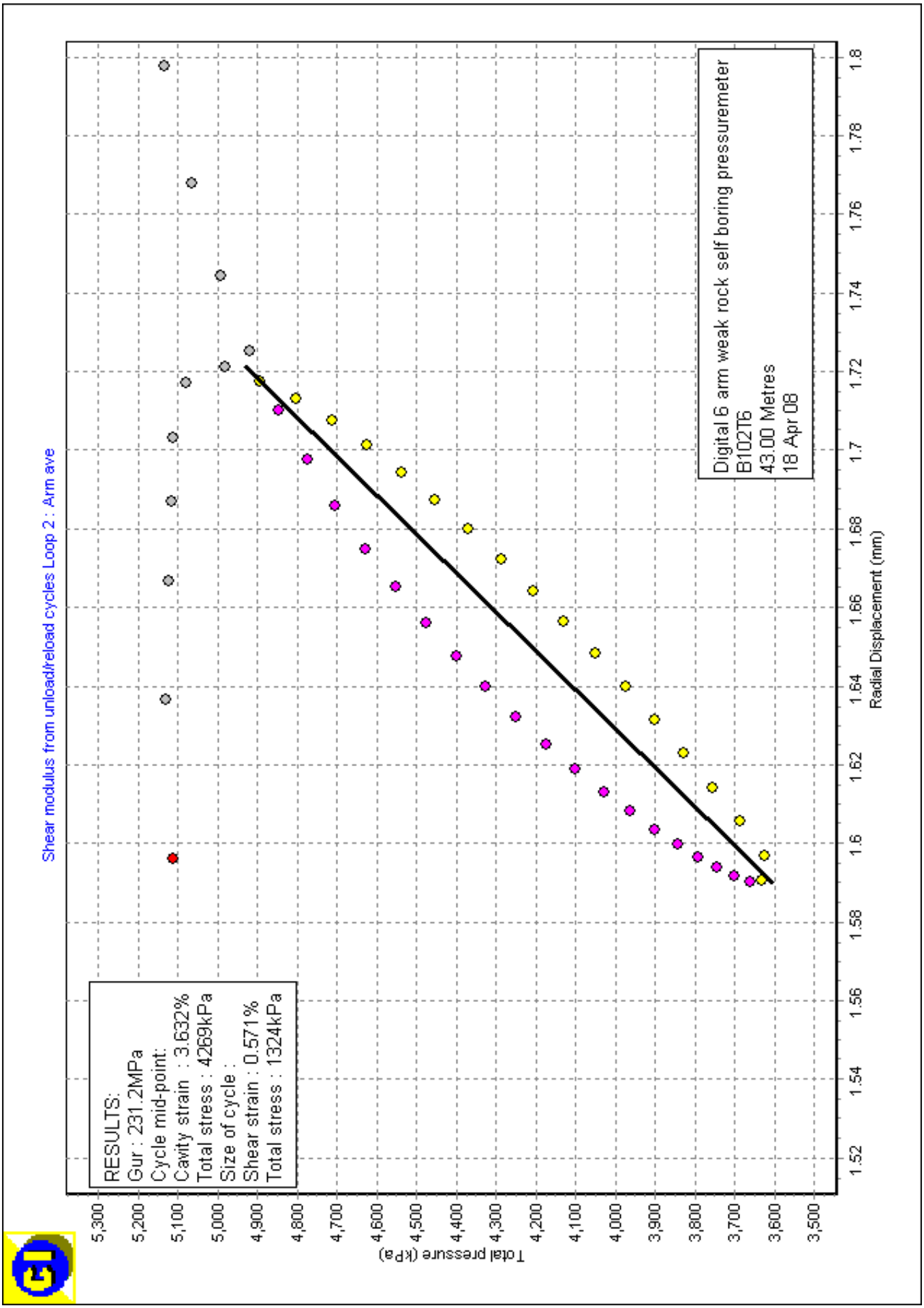

Gibson and Anderson (1961) : Arm ave
RESULTS:
Cu : 1748.7kPa
PI : 9854kPa
Ir : 58
G : 100.7MPa
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Total pressure (kPa)
Ln[shear strain]

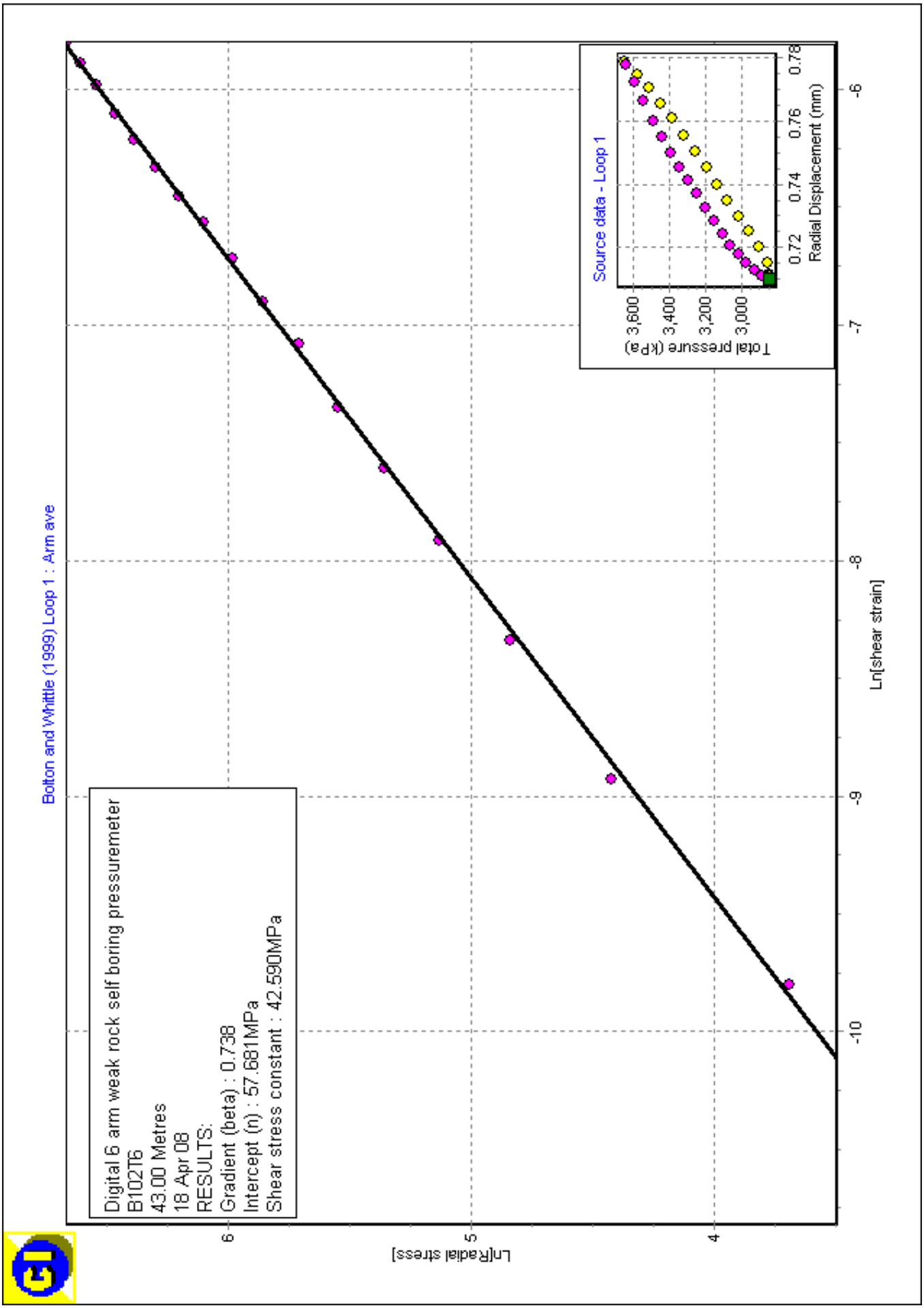

RESULTS:
Cu : 1047.3kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Total pressure (kPa)
Ln[shear strain]

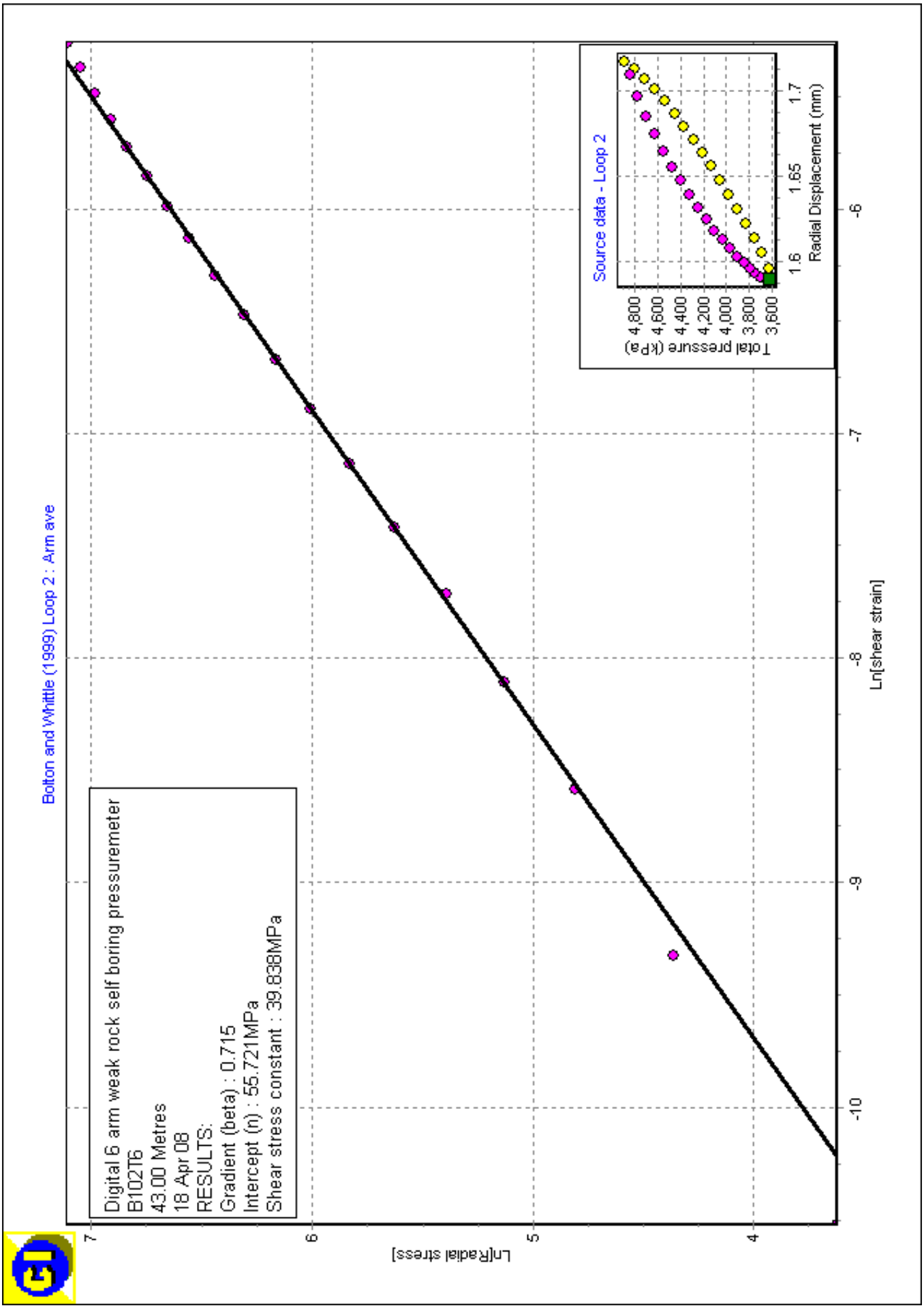

Palmer 1972 (expansion) : Arm ave
RESULTS:
Cu : 1748.7kPa
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Shear stress (kPa)
Shear strain (%)

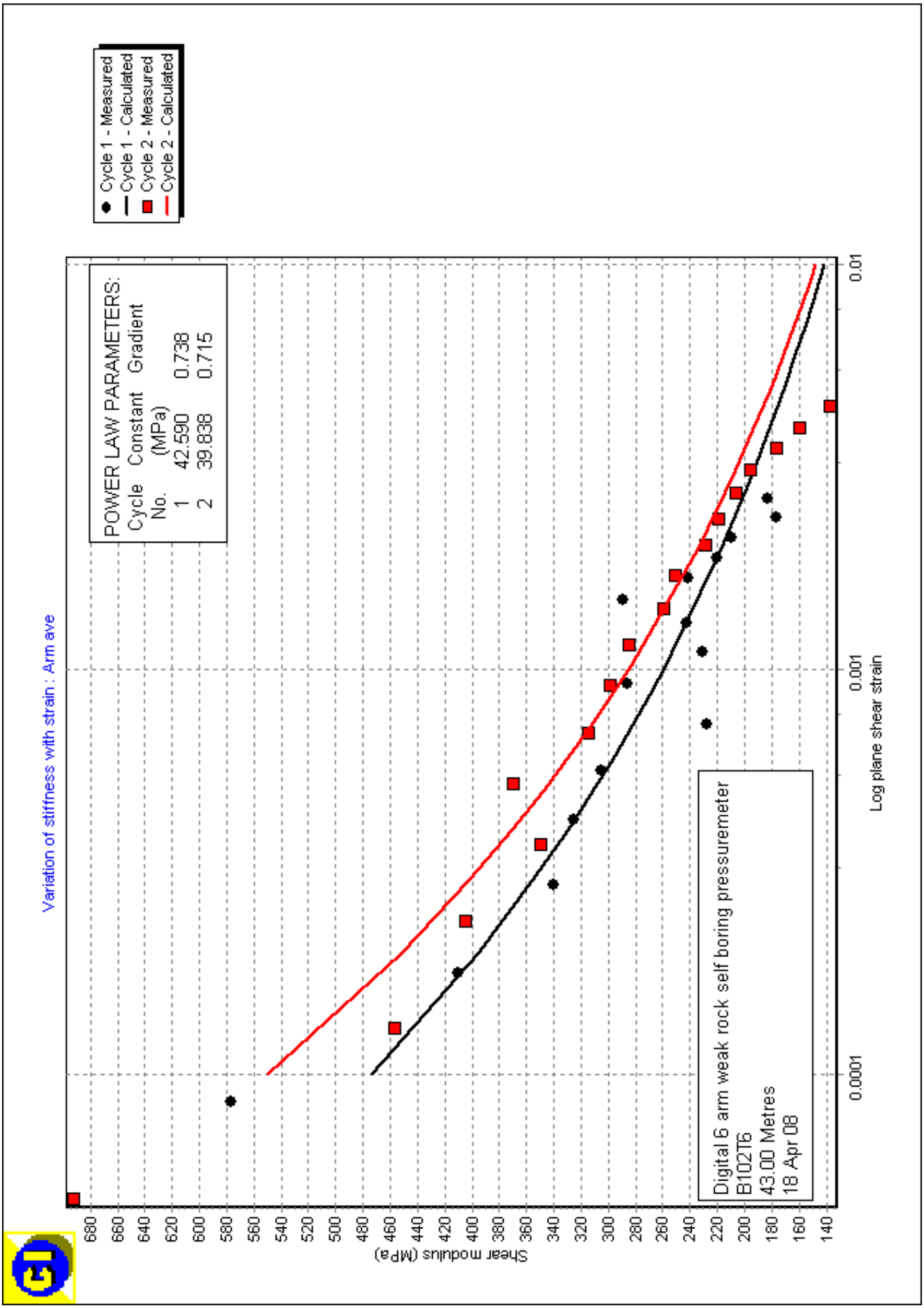

Palmer 1972 (contraction) : Arm ave
RESULTS:
2Cu : 2094.6kPa
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Shear stress (kPa)
Shear strain (%)

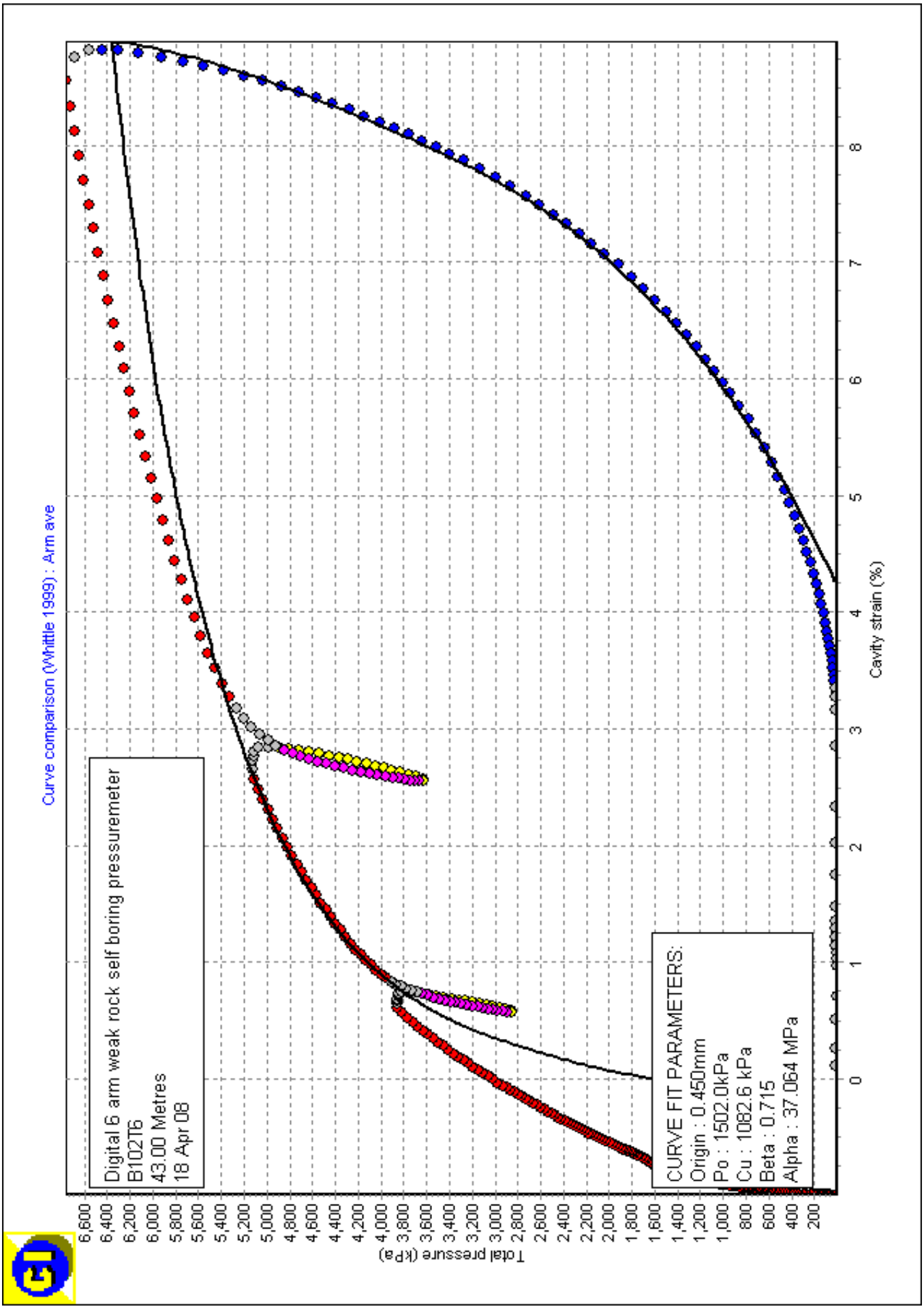

Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 261.8MPa
Cycle mid-point:
Cavity strain : 1.569%
Total stress : 3258kPa
Size of cycle :
Shear strain : 0.325%
Total stress : 852kPa
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 231.2MPa
Cycle mid-point:
Cavity strain : 3.632%
Total stress : 4269kPa
Size of cycle :
Shear strain : 0.571%
Total stress : 1324kPa
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
Total pressure (kPa)
Radial Displacement (mm)
5,300
5,200
5,100
5,000
4,900
4,800
4,700
4,600
4,500
4,400
4,300
4,200
4,100
4,000
3,900
3,800
3,700
3,600
3,500
1.52
1.54
1.56
1.58
1.6
1.62
1.64
1.66
1.68
1.7
1.72
1.74
1.76
1.78
1.8


Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
RESULTS:
Gradient (beta) : 0.738
Intercept (n) : 57.681MPa
Shear stress constant : 42.590MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 1
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 2 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
RESULTS:
Gradient (beta) : 0.715
Intercept (n) : 55.721MPa
Shear stress constant : 39.838MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)


Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
POWER LAW PARAMETERS:
Cycle No. Constant (MPa) Gradient
1 42.590 0.738
2 39.838 0.715
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
0.0001
0.001
0.01
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08


Curve comparison (Whittle 1999) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T6
43.00 Metres
18 Apr 08
CURVE FIT PARAMETERS:
Origin : 0.450mm
Po : 1502.0kPa
Cu : 1082.6 kPa
Beta : 0.715
Alpha : 37.064 MPa
Total pressure (kPa)
Cavity strain (%)

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
DENMARK PLACE	18/4/08	FRI	102	6	43

Weather:- OVERCAST Material:- LAMBETH – LAMINATED SAND/CLAY

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
?	11:05	11:40	1M	1M/35MIN.	150 BARS

Ground level :- Orientation:- NR

Water Press.	Inst. OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
200PSI	88.1	89.1	73 RR	3MM	'MOLE'

Drilling Remarks:- SLIGHTLY BARIER - SAND BANDS REDUCE WP

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
– standard	Control	60SEC	300BAR	12.5	TRW	10MP

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-107	83	-67	36	-82	130	-1020	-918	-2448	Ground Level Zeros
									Pre-drilling Zeros
									Post-drilling Zeros
-89	135	-80	24	-83	121	-904	-665	-2447	Pre-test Zeros
									Ground Level Zeros

Test starts:- 11:50.

Line	Notes
561	HOLD.
589	LOOP 1
640	HOLD
693	LOOP 2
717	UNLOAD

Test ends:- 12:31. Max Press:- 6759 KPa.

Calibrated Data details:

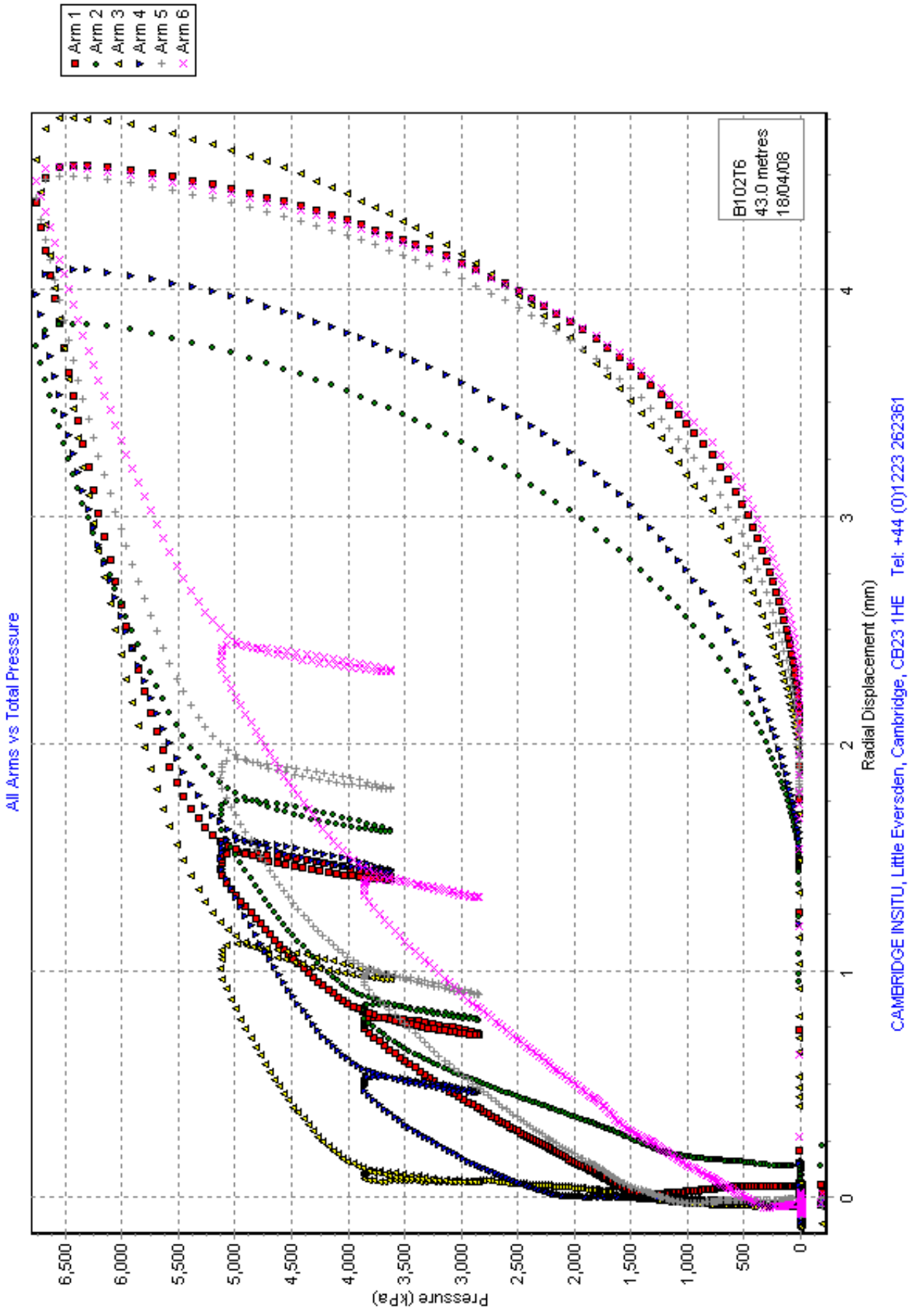
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
W0130T1	W0130T2	10/4/08	11/4/08

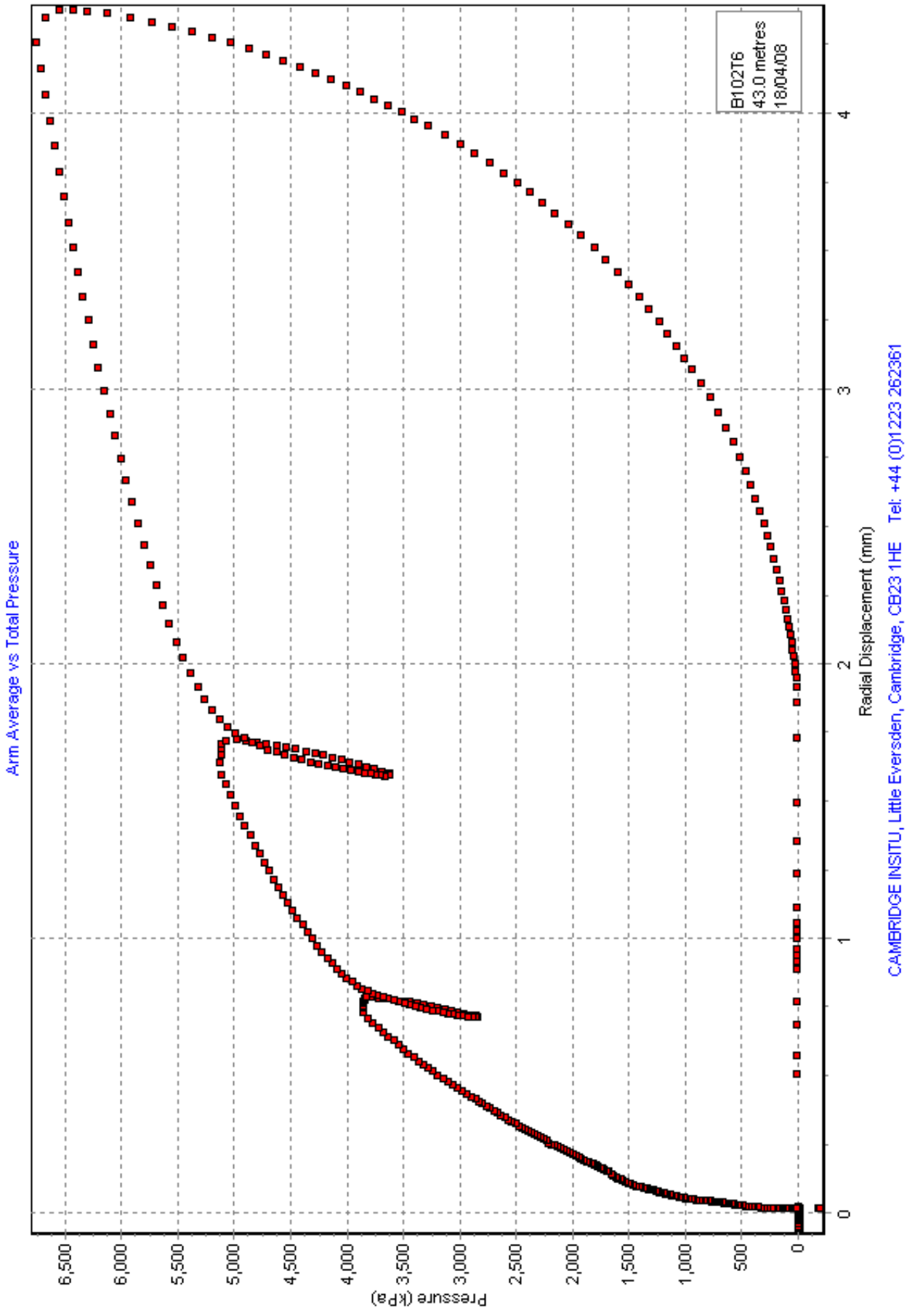
TEST REMARKS: AS BEFORE, GOOD PUMP RESPONSE & STRAIN HARDENING. PUMP FAILS TO ZERO AT END OF TEST.

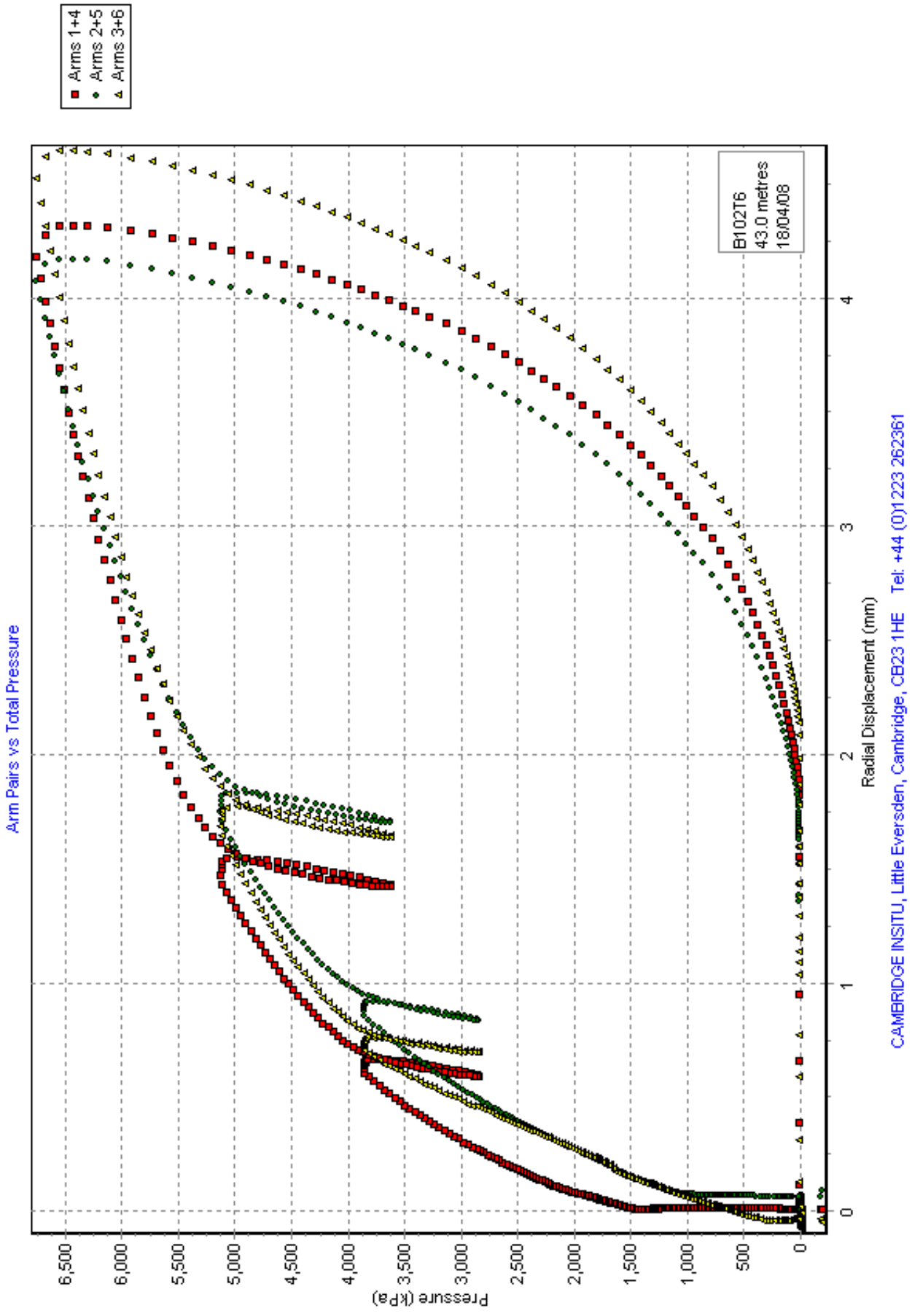
Driller: DAN

Tester: RW

CAMBRIDGE INSITU, Little Eversden, Cambridge CB3 7HE Tel: (01223) 262 361 Fax: (01223) 263 947
E-mail: CamInsitu@AOL.com Web site: Cambridge-Insitu.com


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
All Arms vs Total Pressure
B102T6
43.0 metres
18/04/08
Pressure (kPa)
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Radial Displacement (mm)
0
1
2
3
4
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
B102T6
43.0 metres
18/04/08
Pressure (kPa)
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Radial Displacement (mm)
0
1
2
3
4
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arms 1+4
Arms 2+5
Arms 3+6
Arm Pairs vs Total Pressure
B102T6
43.0 metres
18/04/08
Pressure (kPa)
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Radial Displacement (mm)
0
1
2
3
4
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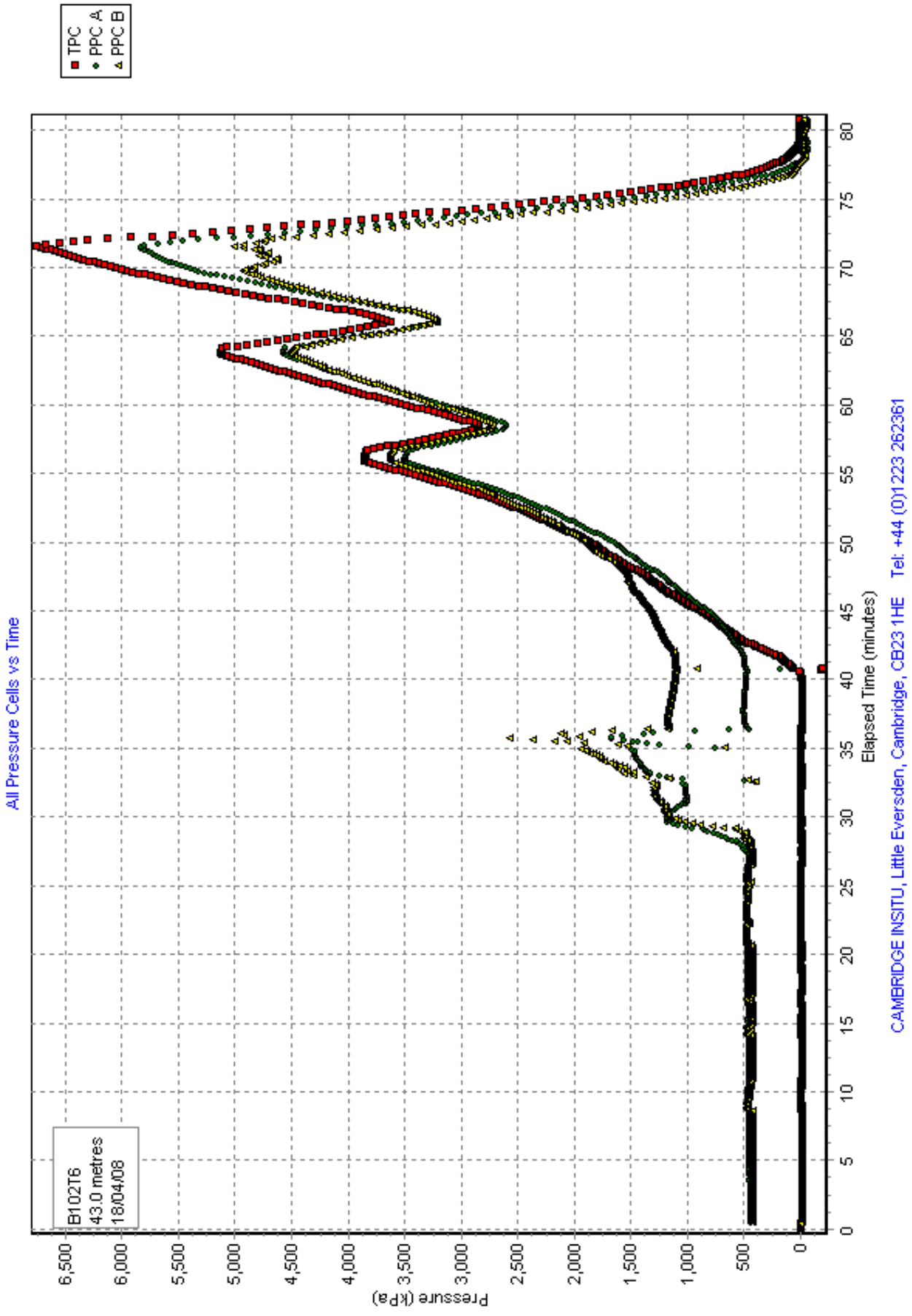
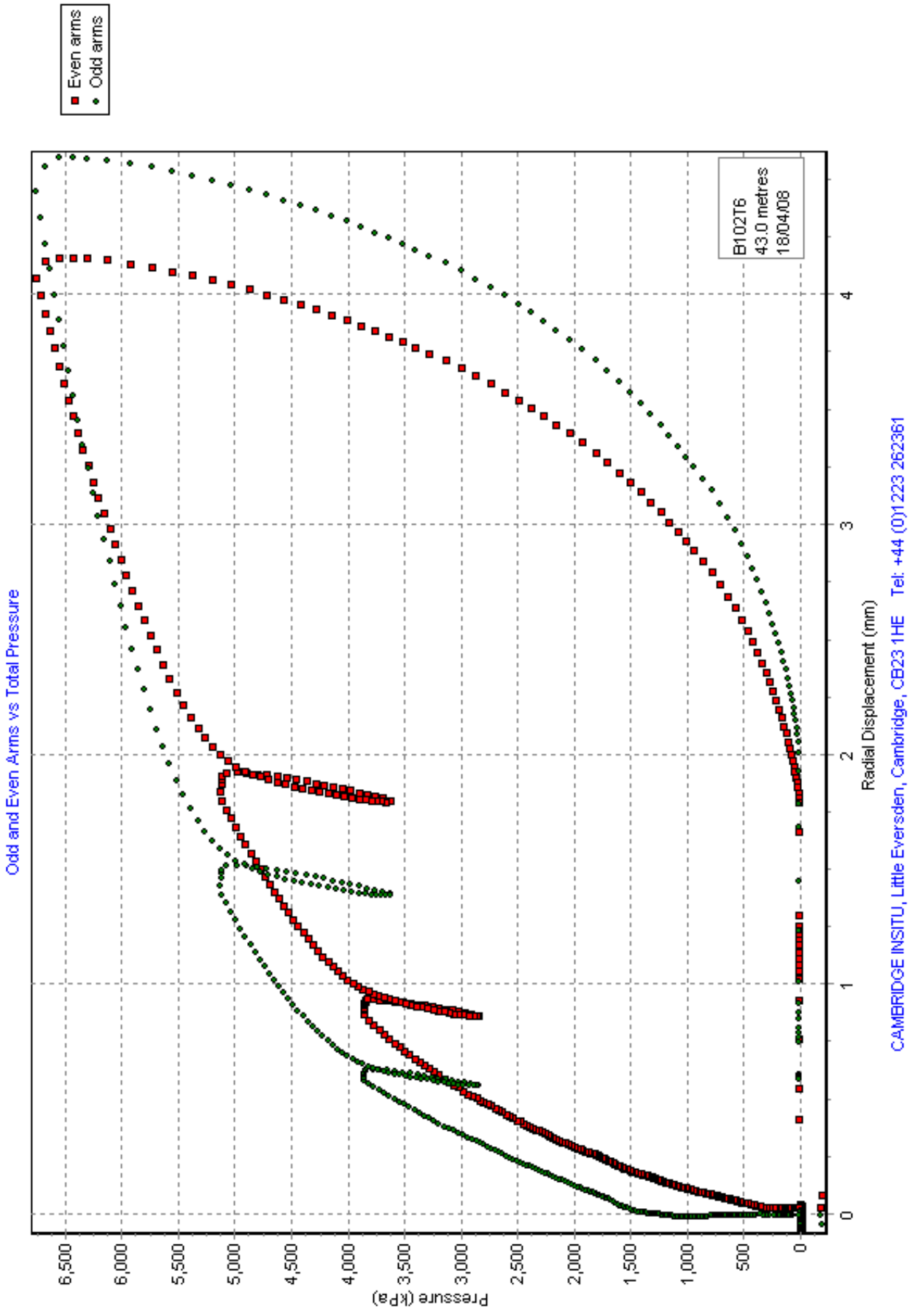

TPC
PPC A
PPC B
All Pressure Cells vs Time
B102T6
43.0 metres
18/04/08
Pressure (kPa)
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Elapsed Time (minutes)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T6
43.0 metres
18/04/08
Pressure (kPa)
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Radial Displacement (mm)
0
1
2
3
4
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361

B102T7 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]
Project : 36237
Site : Denmark Place
Borehole : BH102
Test name : B102T7
Test date : 21 Apr 08
Test depth : 47.90 Metres
Water table : 5.6 Metres
Ambient PWP : 0.0 kPa
Material : Upnor Beds
Probe : Digital 6 arm weak rock self boring pressuremeter
Diameter : 88.1 mm
Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out

Analysed by RWW on 22 Apr 08

Remarks: Shoe edge and CHL badly damaged by gravel. Material gravelly, silty, greenish sand.

[RESULTS FOR CAVITY REFERENCE PRESSURE]
Strain Origin (mm) : "Arm ave=2.016"
Po from Marsland & Randolph (kPa) : "Arm ave=1389.5"
Best estimate of Po (kPa) : "Arm ave=1390.0"

[UNDRAINED STRENGTH PARAMETERS]
Jefferies 1988 - Cu (kPa) : "Arm ave=722.9"
Undrained yield stress (kPa) : "Arm ave=2051.2"

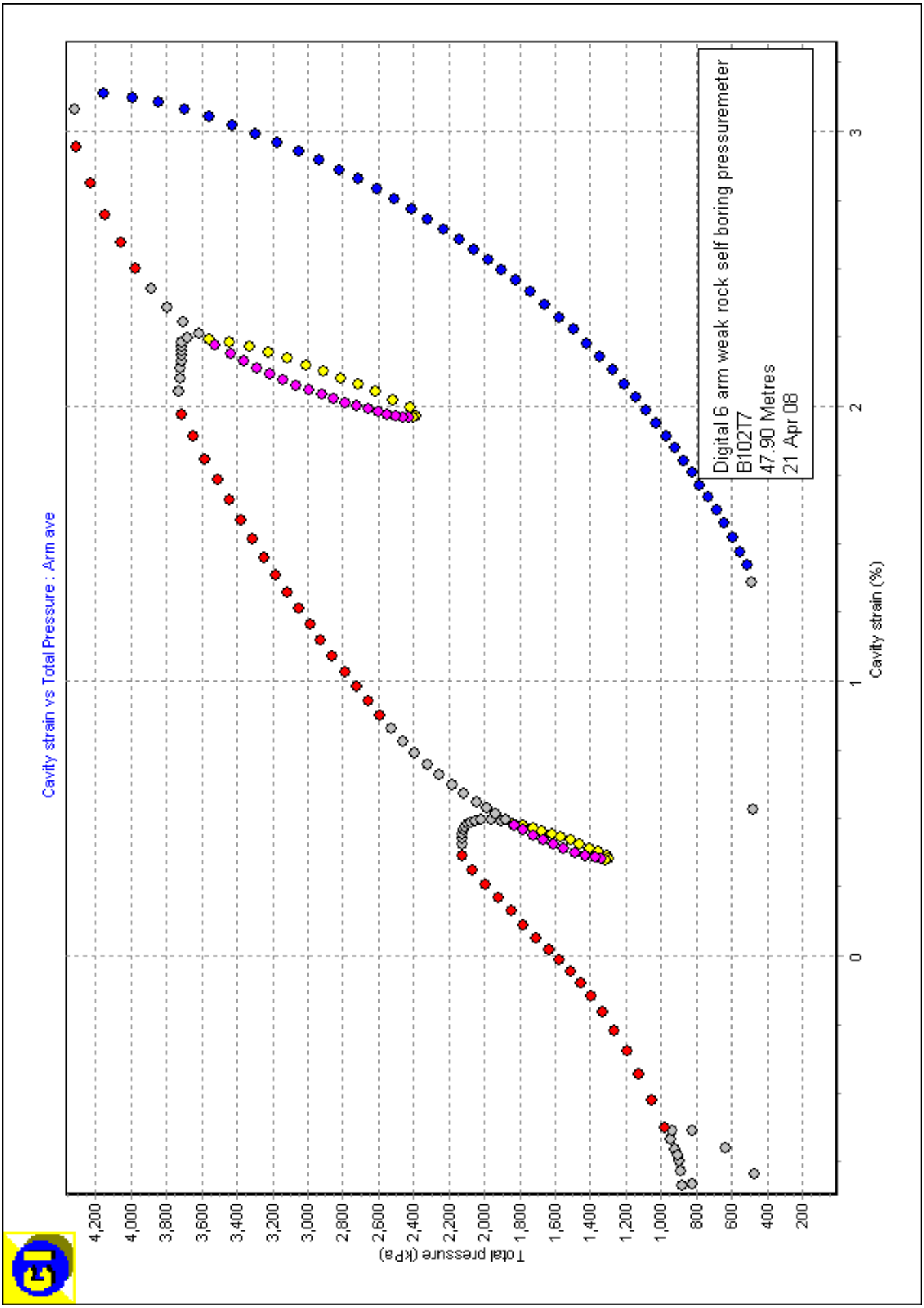
[DRAINED ANALYSIS OF SANDS - HUGHES et al 1977]
Constant volume friction angle (°) : 32.0
Angle of internal friction (°) : "Arm ave=39.3"
Dilation angle (°) : "Arm ave=9.0"
Gradient of log-log plot : "Arm ave=0.448"

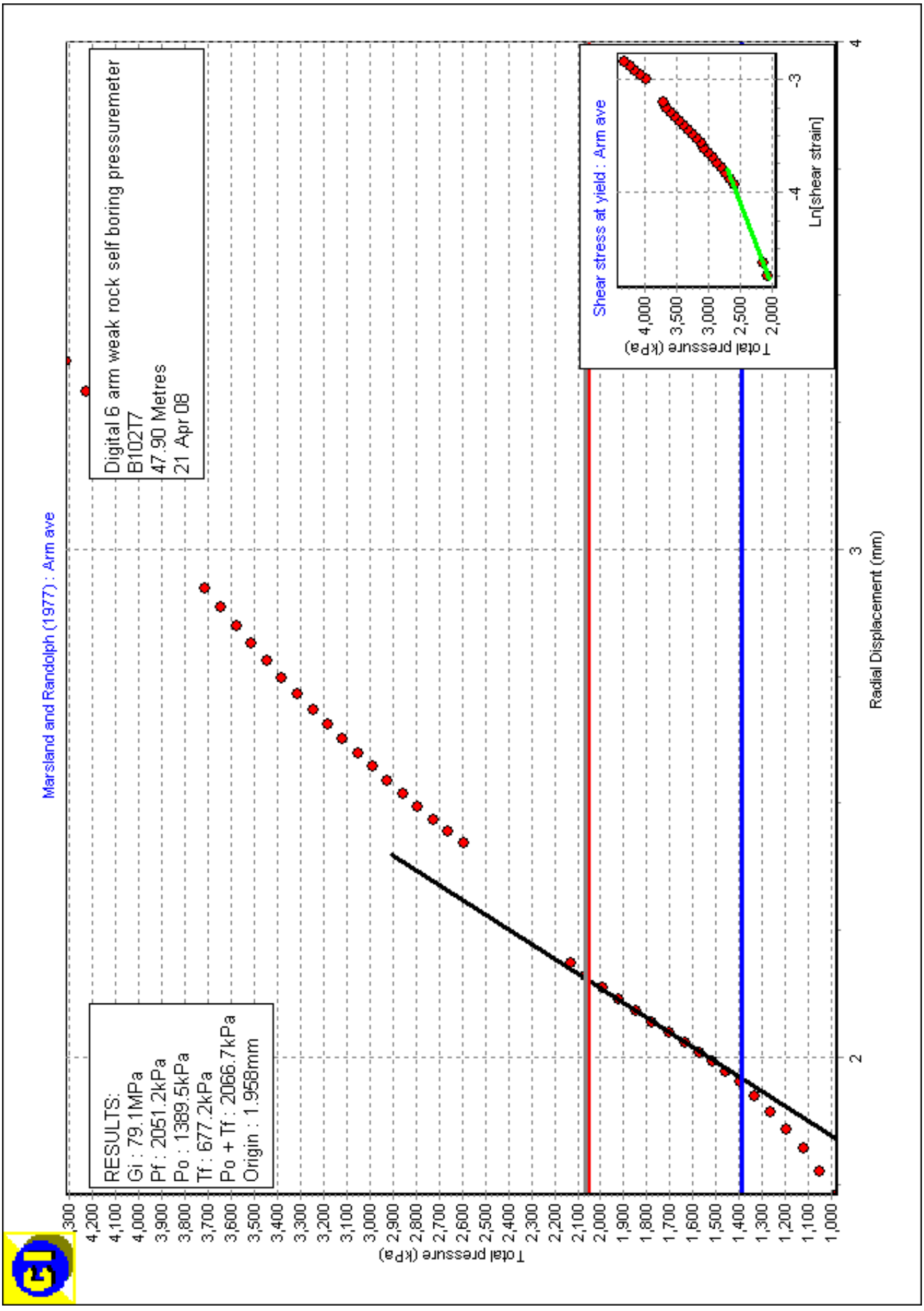
[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=79.1"

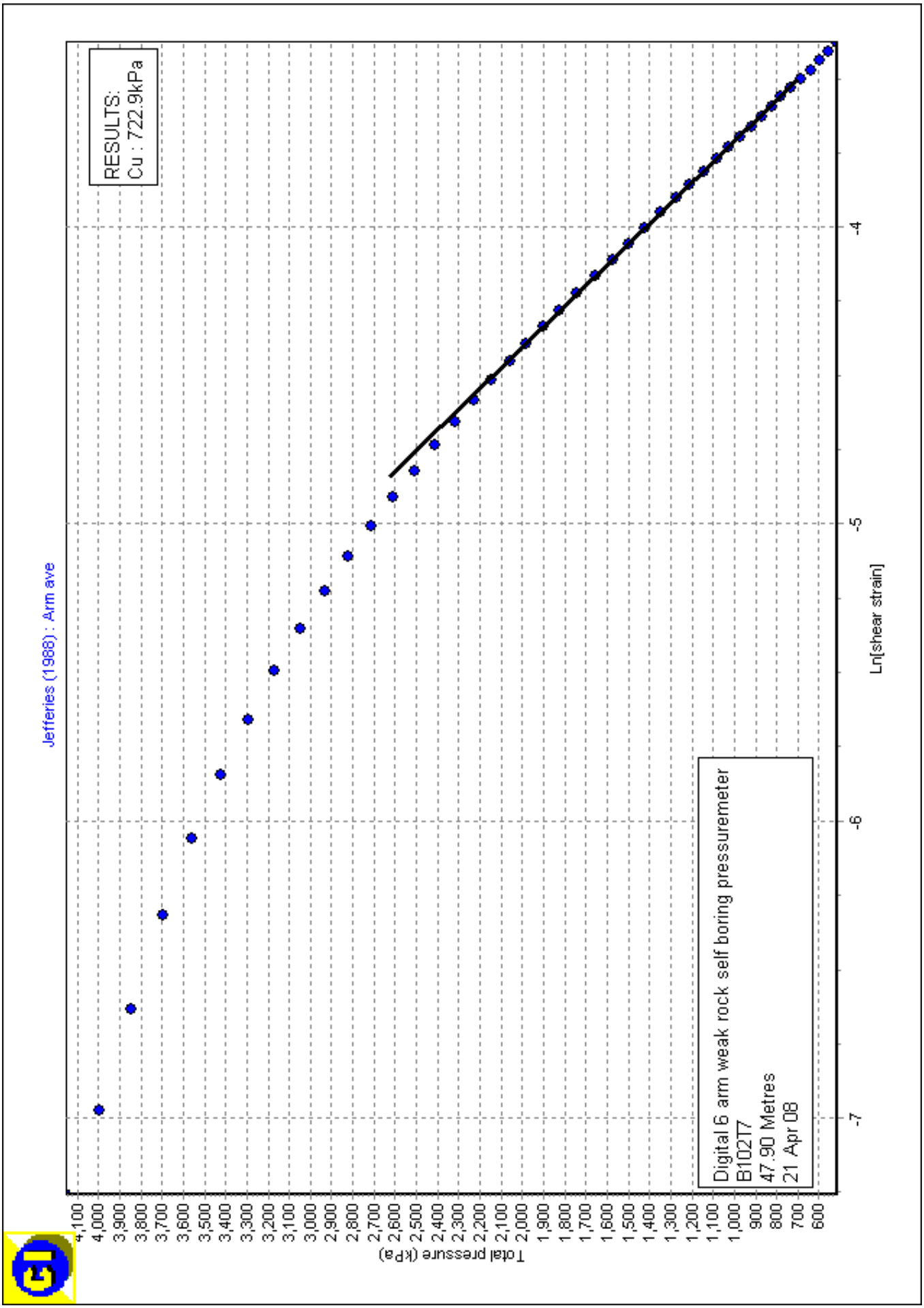
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	205.7	0.423	1568	0.278	573
Arm ave	2	208.5	2.111	2985	0.577	1208

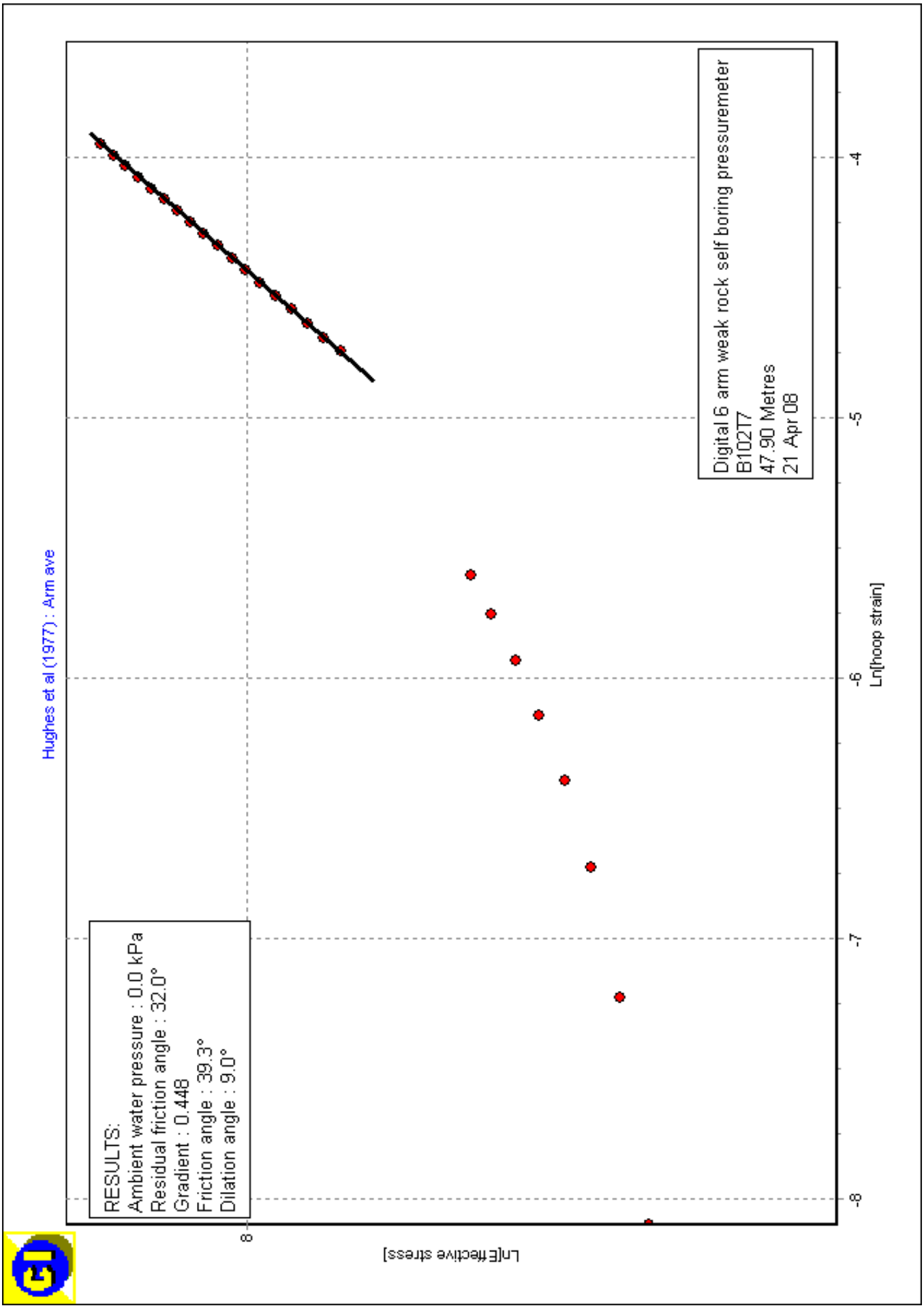
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

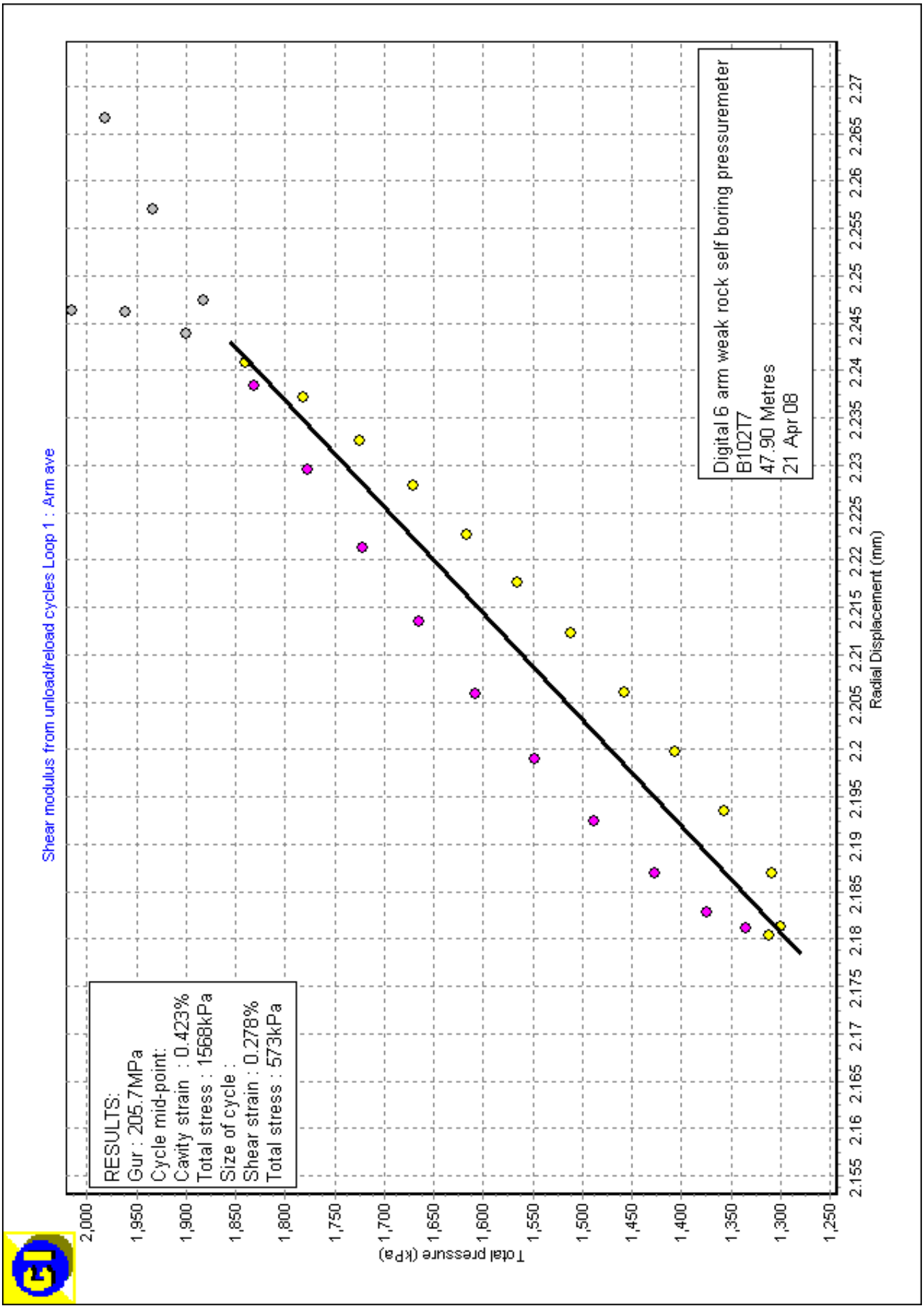
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	29.940	20.126	0.672
Arm ave	2	41.164	28.039	0.681

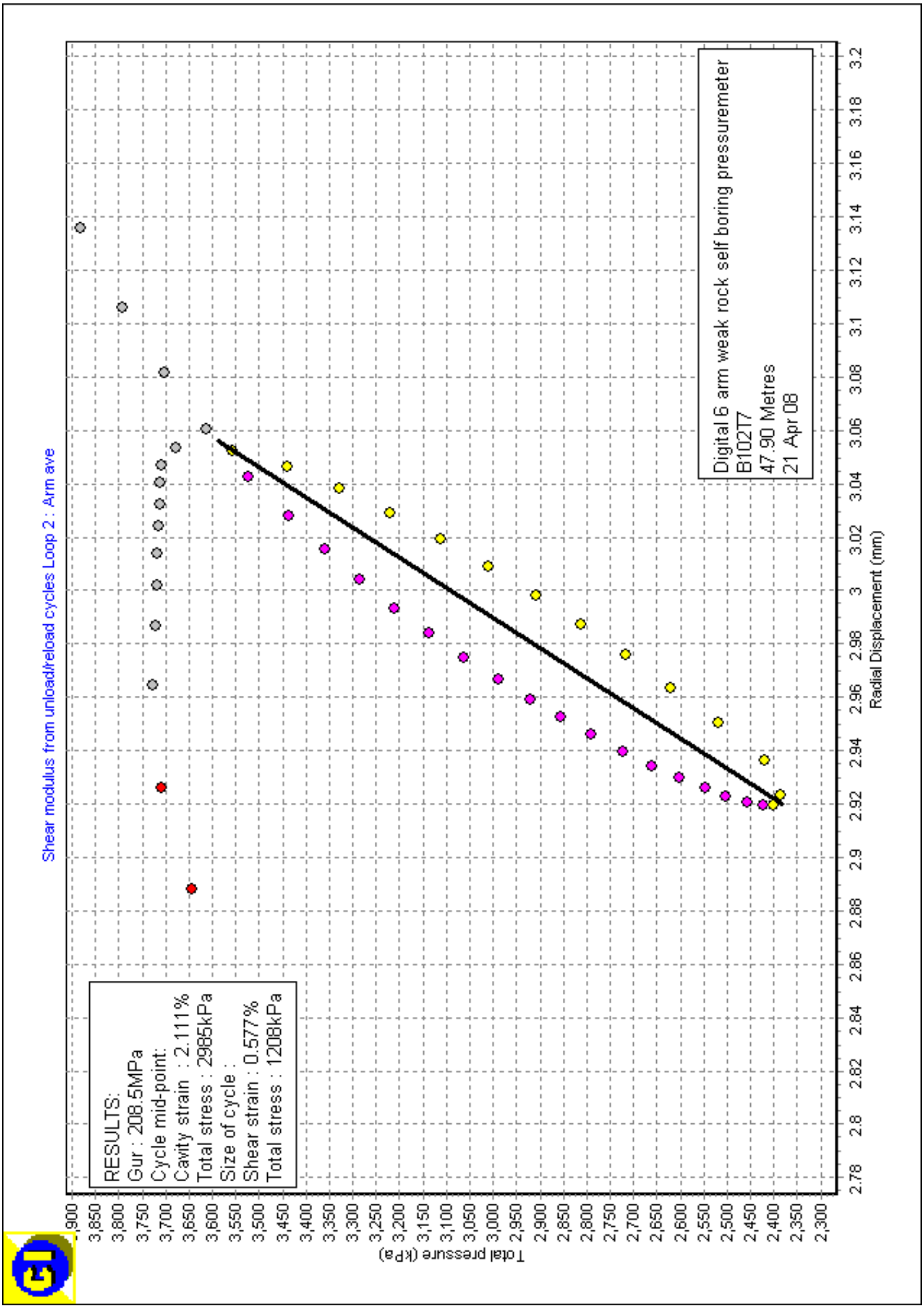

Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B1027
47.90 Metres
21 Apr 08
Total pressure (kPa)
Cavity strain (%)
4,200
4,000
3,800
3,600
3,400
3,200
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1
2
3

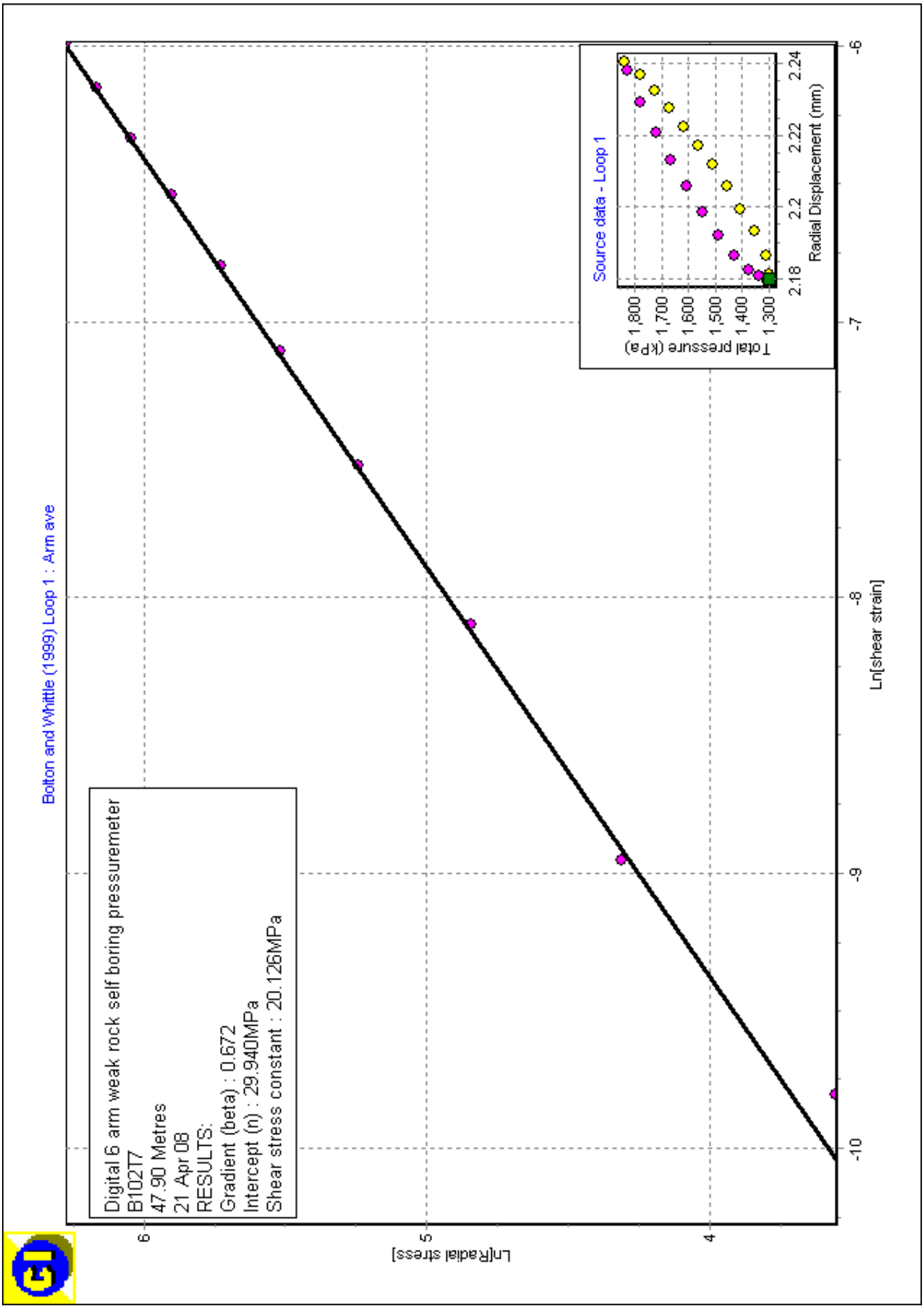

Digital 6 arm weak rock self boring pressuremeter
B102T7
47.90 Metres
21 Apr 08
RESULTS:
Gi : 79.1MPa
Pf : 2051.2kPa
Po : 1389.5kPa
Tf : 677.2kPa
Po + Tf : 2066.7kPa
Origin : 1.958mm
Marsland and Randolph (1977) : Arm ave
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]

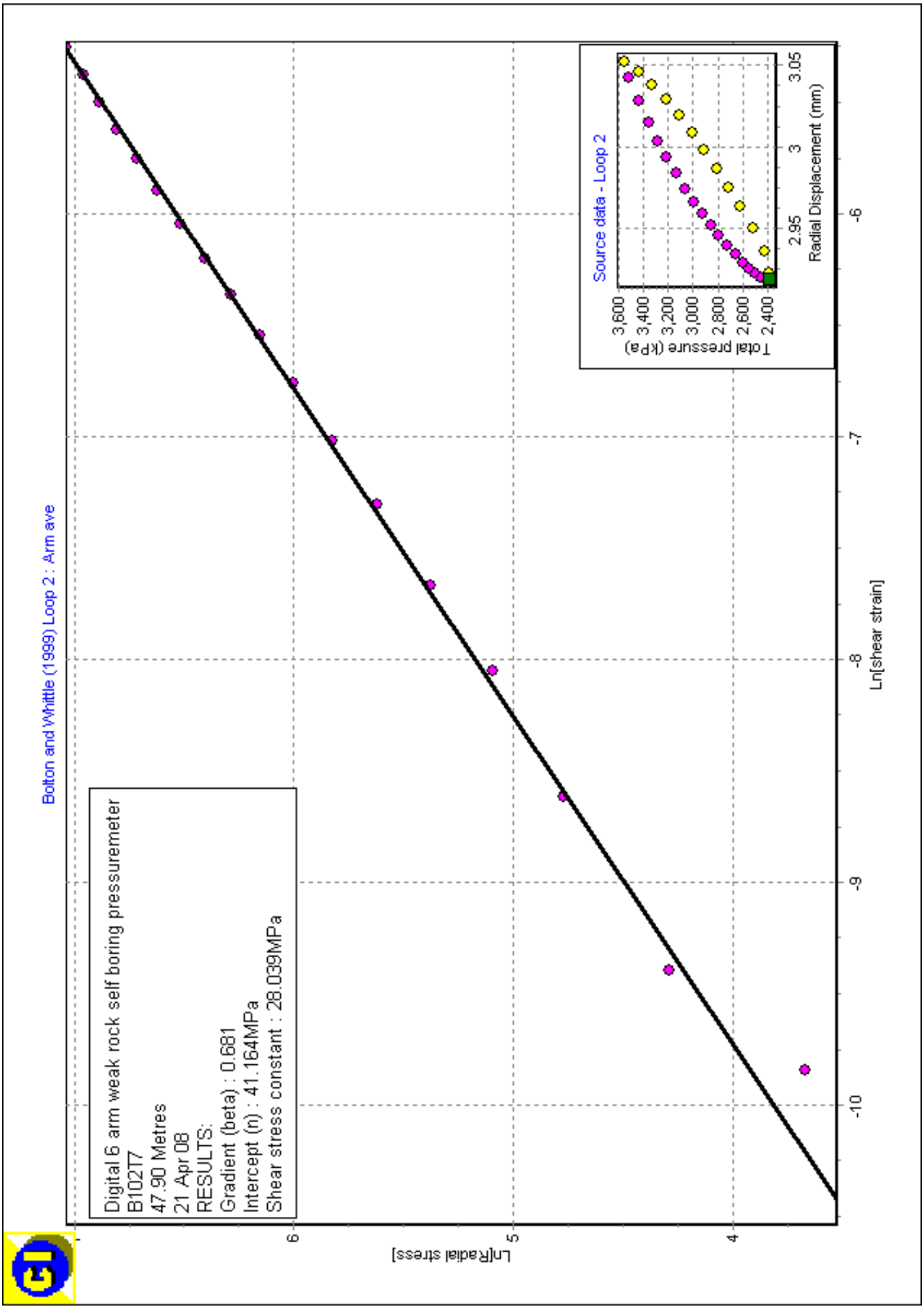

RESULTS:
Cu : 722.9kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T7
47.90 Metres
21 Apr 08
Total pressure (kPa)
Ln[shear strain]

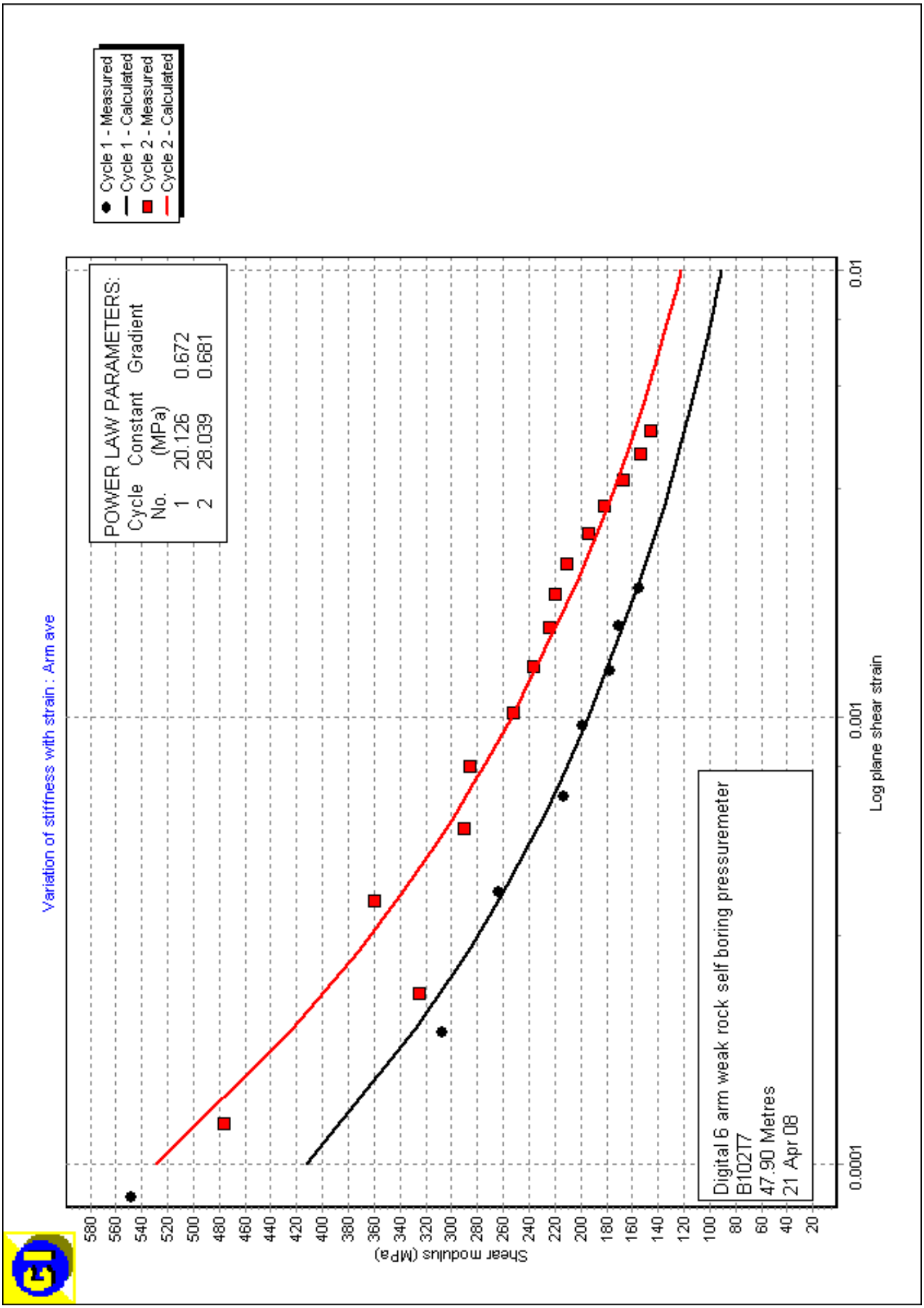

Digital 6 arm weak rock self boring pressuremeter
B1027
47.90 Metres
21 Apr 08
RESULTS:
Ambient water pressure : 0.0 kPa
Residual friction angle : 32.0°
Gradient : 0.448
Friction angle : 39.3°
Dilation angle : 9.0°
Hughes et al (1977) : Arm ave
Ln[Effective stress]
Ln[hoop strain]
8
-4
-5
-6
-7
-8

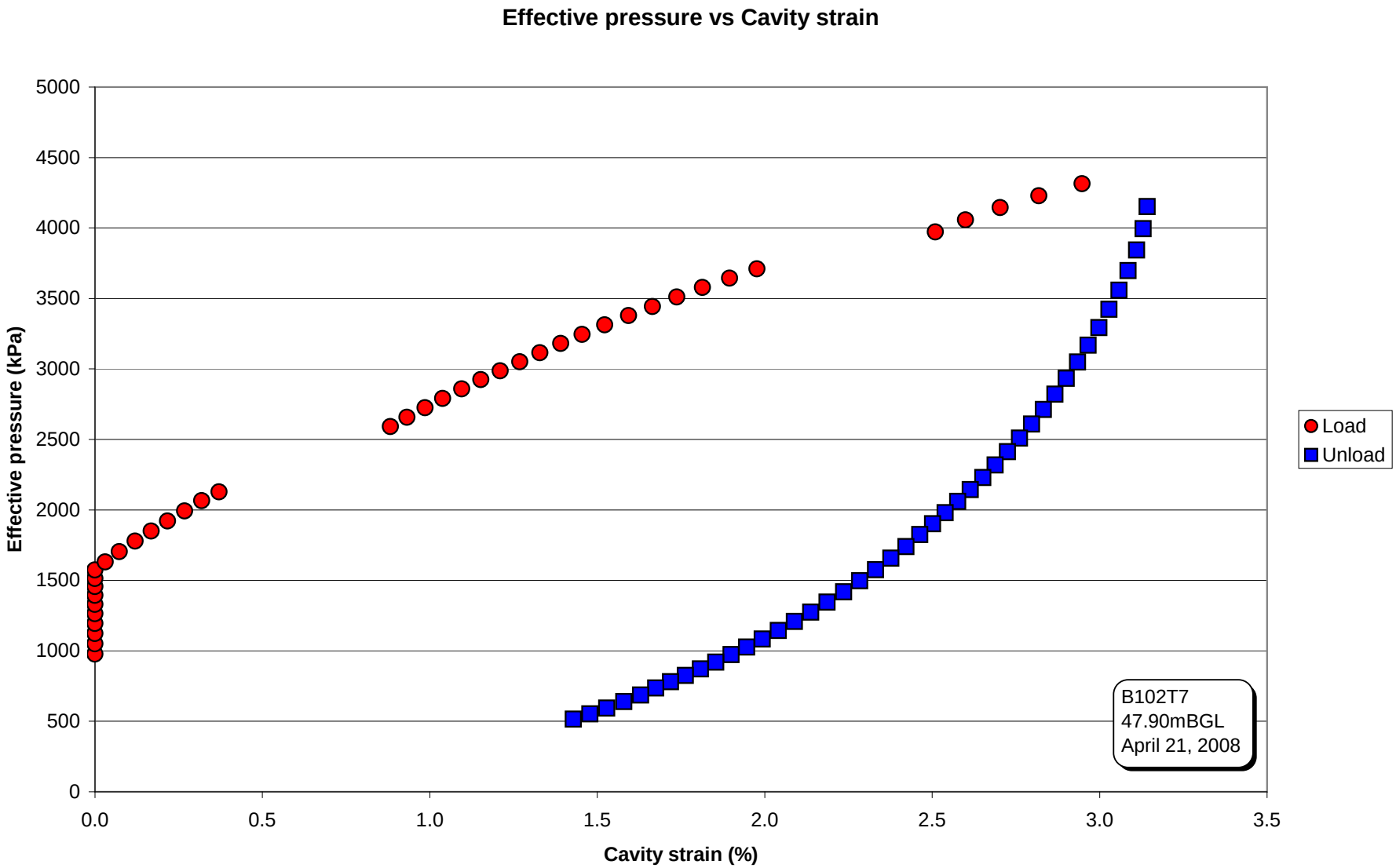

Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 205.7MPa
Cycle mid-point:
Cavity strain : 0.423%
Total stress : 1568kPa
Size of cycle :
Shear strain : 0.278%
Total stress : 573kPa
Digital 6 arm weak rock self boring pressuremeter
B102T7
47.90 Metres
21 Apr 08
Total pressure (kPa)
Radial Displacement (mm)
2,000
1,950
1,900
1,850
1,800
1,750
1,700
1,650
1,600
1,550
1,500
1,450
1,400
1,350
1,300
1,250
2.155
2.16
2.165
2.17
2.175
2.18
2.185
2.19
2.195
2.2
2.205
2.21
2.215
2.22
2.225
2.23
2.235
2.24
2.245
2.25
2.255
2.26
2.265
2.27


Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 208.5MPa
Cycle mid-point:
Cavity strain : 2.111%
Total stress : 2985kPa
Size of cycle :
Shear strain : 0.577%
Total stress : 1208kPa
Digital 6 arm weak rock self boring pressuremeter
B1027
47.90 Metres
21 Apr 08
Total pressure (kPa)
Radial Displacement (mm)

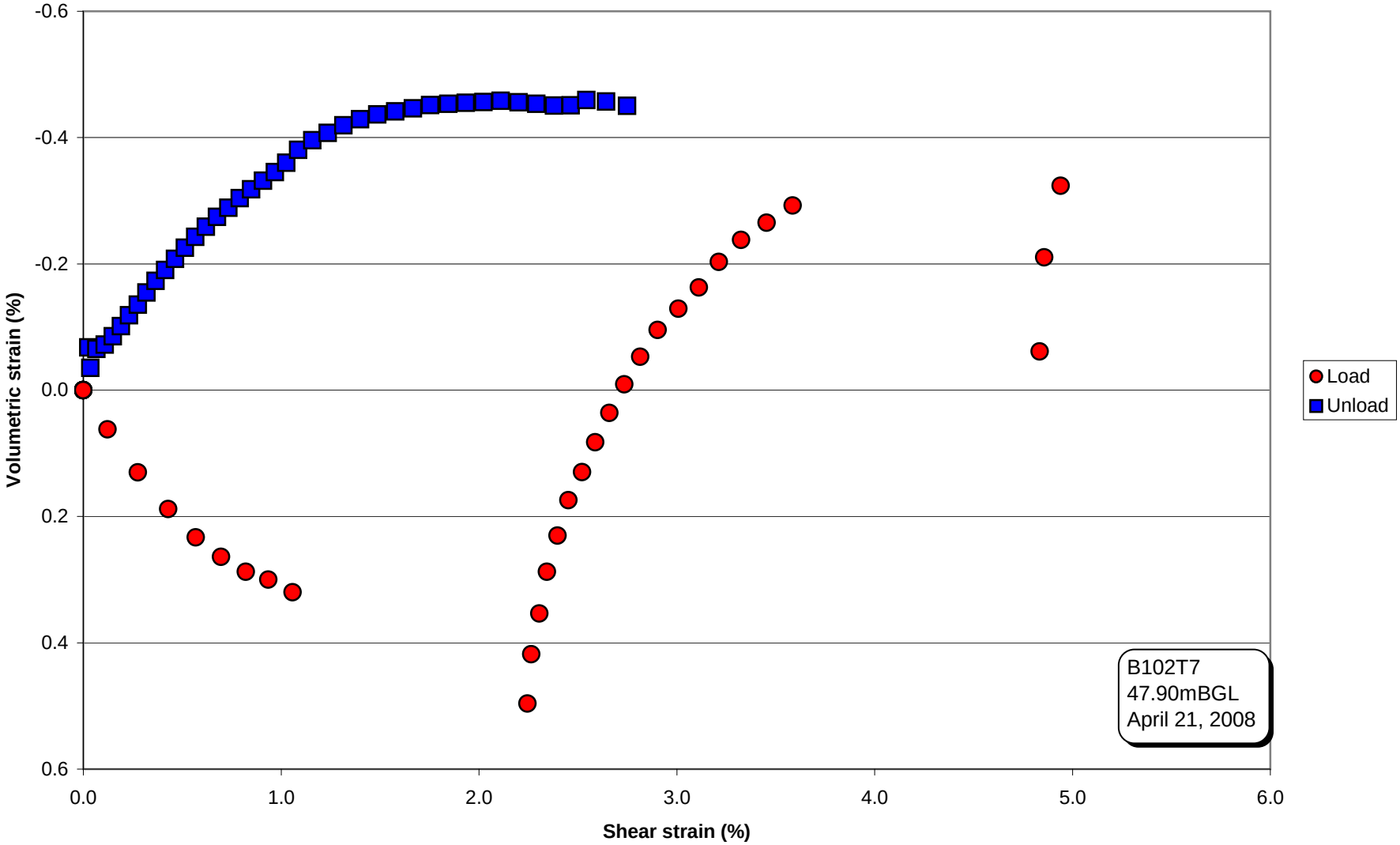

Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T7
47.90 Metres
21 Apr 08
RESULTS:
Gradient (beta) : 0.672
Intercept (n) : 29.940MPa
Shear stress constant : 20.126MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 1
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 2 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T7
47.90 Metres
21 Apr 08
RESULTS:
Gradient (beta) : 0.681
Intercept (n) : 41.164MPa
Shear stress constant : 28.039MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)

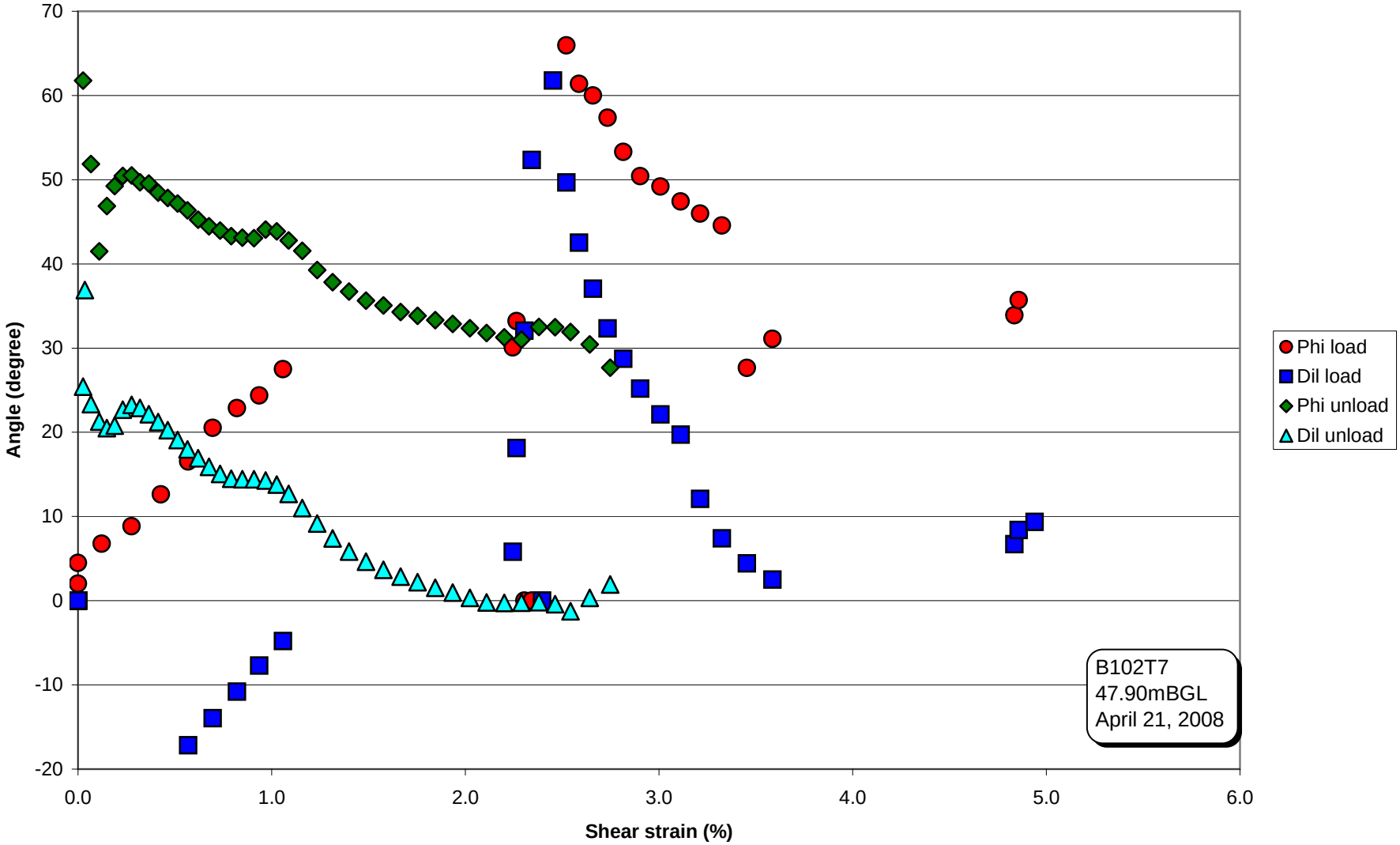

Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
POWER LAW PARAMETERS:
Cycle No.
Constant (MPa)
Gradient
1 20.126 0.672
2 28.039 0.681
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
0.0001
0.001
0.01
Digital 6 arm weak rock self boring pressuremeter
B102T7
47.90 Metres
21 Apr 08


Effective pressure vs Cavity strain
Effective pressure (kPa)
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
Cavity strain (%)
Load
Unload
B102T7
47.90mBGL
April 21, 2008

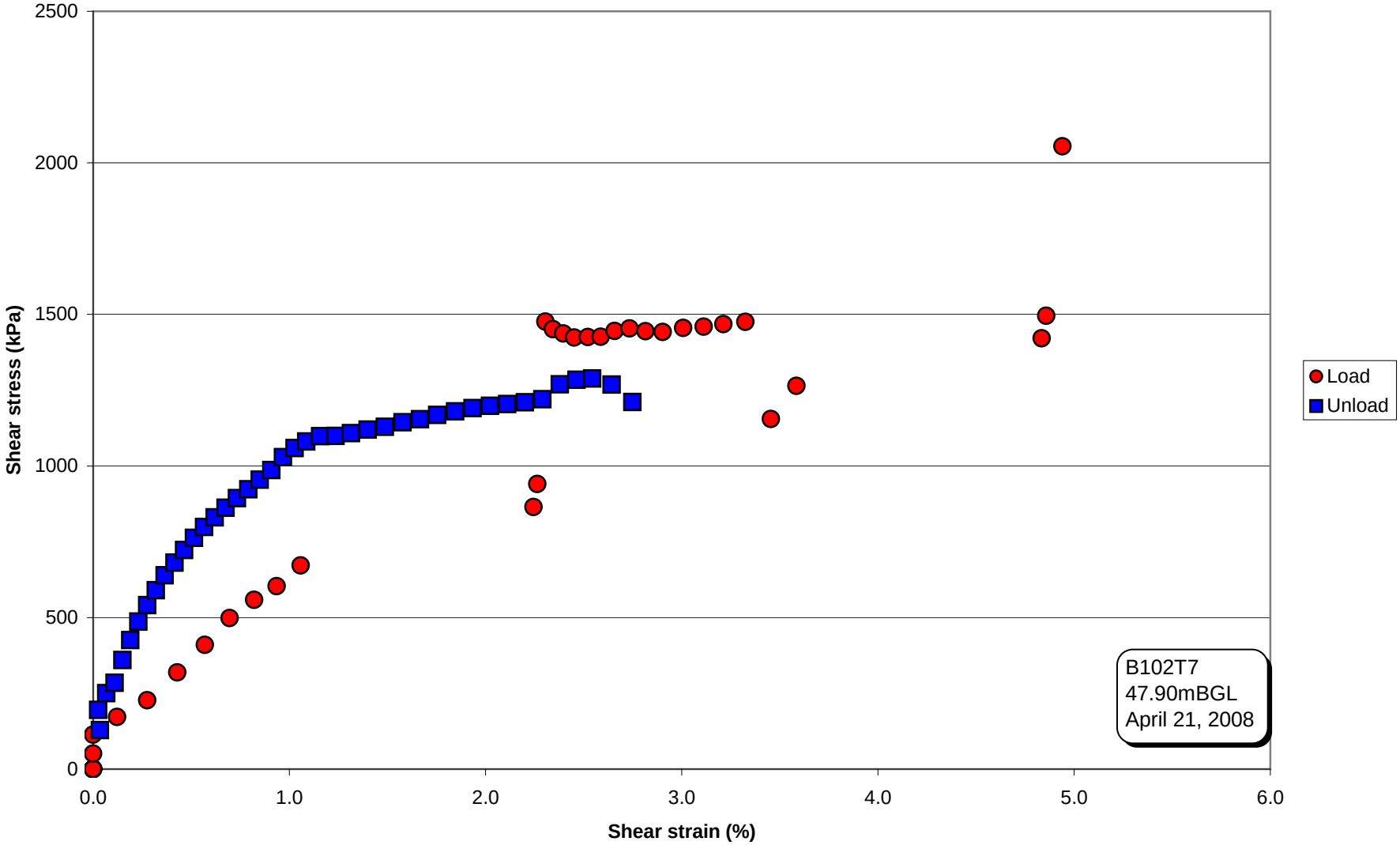
Volumetric strain vs Shear strain

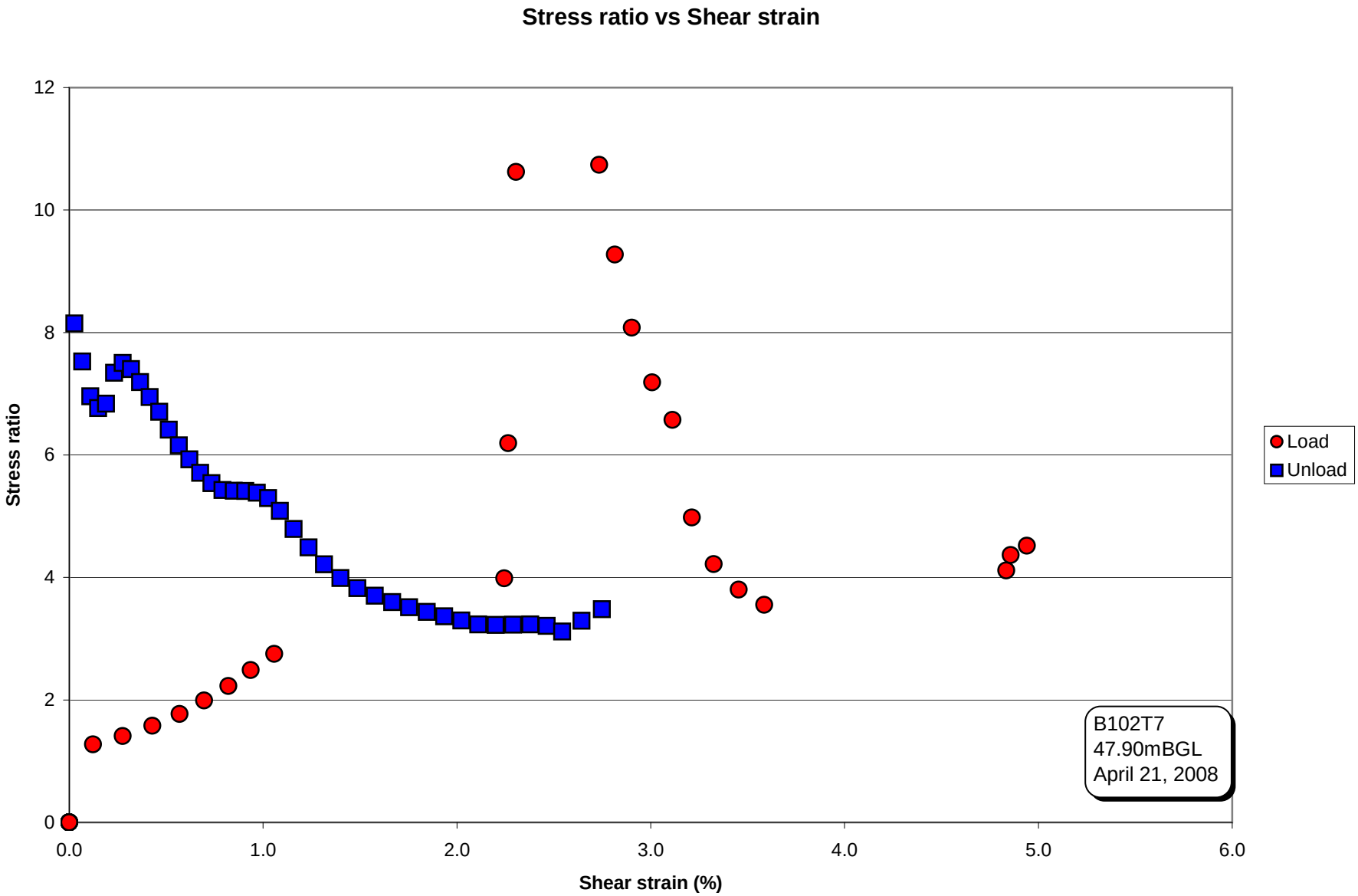


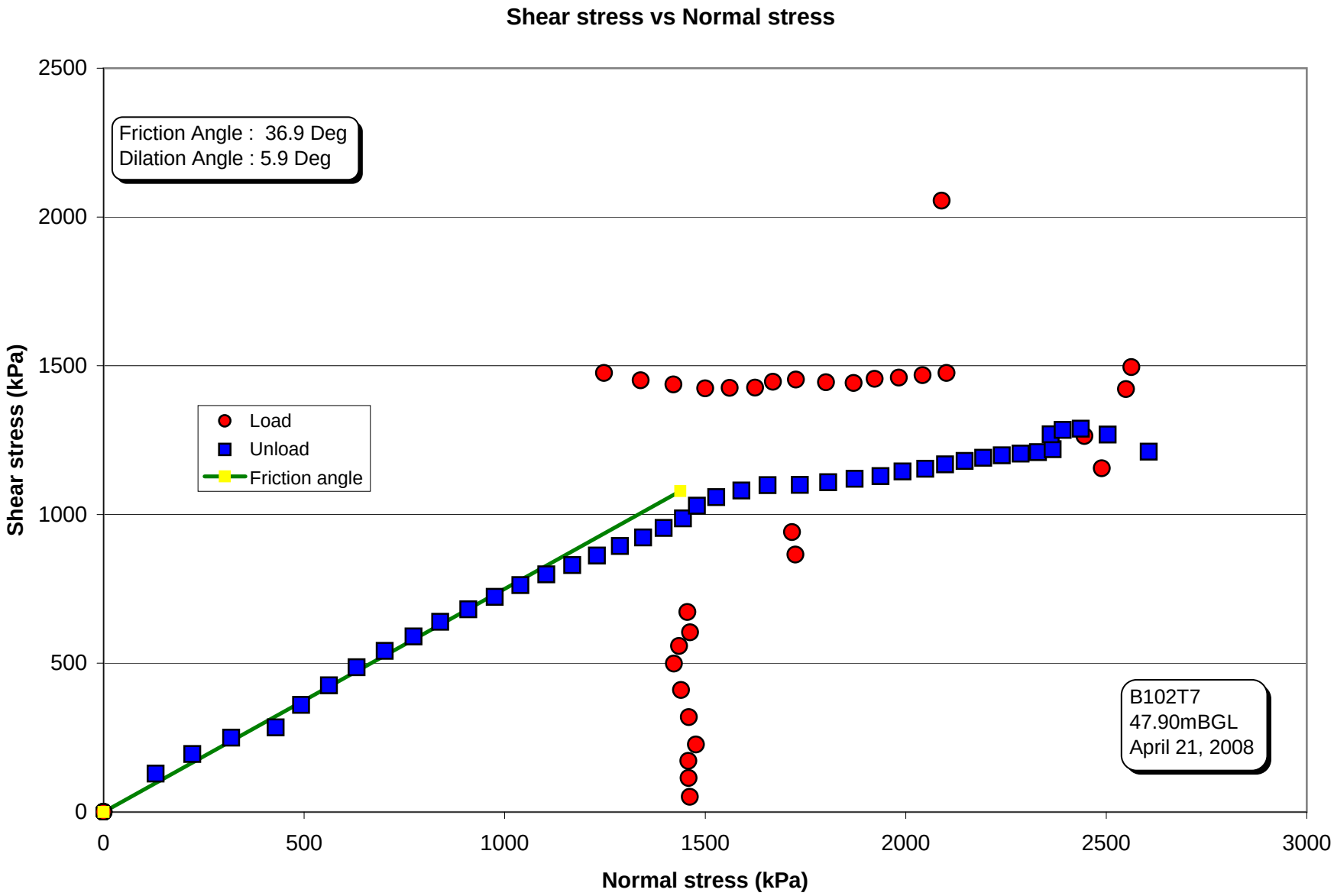
Angles of friction and dilation vs Shear strain



Shear stress vs Shear strain




Stress ratio vs Shear strain
Stress ratio
Shear strain (%)
0
2
4
6
8
10
12
0.0
1.0
2.0
3.0
4.0
5.0
6.0
Load
Unload
B102T7
47.90mBGL
April 21, 2008


Shear stress vs Normal stress
Friction Angle : 36.9 Deg
Dilation Angle : 5.9 Deg
Load
Unload
Friction angle
B102T7
47.90mBGL
April 21, 2008
Shear stress (kPa)
Normal stress (kPa)
0
500
1000
1500
2000
2500
3000

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
DENMARK PLACE	21/4/08	MON	B102	7	17.9m.

Weather:- Material:- THANETS? SANDY, SILTY, Band/ GRAVEL

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
?	15:07	15:56	0.9m	1m/50mins	160 BARS

Ground level :- Orientation:-

Water Press.	Inst.OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
	88.1	89.1	TR-R	3mm	"MOLLY"

Drilling Remarks:- V. difficult.

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
— MANUAL —		65sec	300BARS	13.0V	TEXAS	10MPa.

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-107	84	-70	35	-84	132	-1033	-923	-2445	Ground Level Zeros
									Pre-drilling Zeros
									Post-drilling Zeros
-108	79	-73	39	-76	118	-901	-801	-2441	Pre-test Zeros
									Ground Level Zeros

Test starts:- 16:00

Line	Notes
546	Horiz 2.1MPa.
551	Loop 1 G = 21.3MPa.
609	Horiz 3.7MPa.
618	Loop 2. G = 20.6MPa.
660	Unload

Test ends:- 16:20. Max Press:- 4314 kPa.

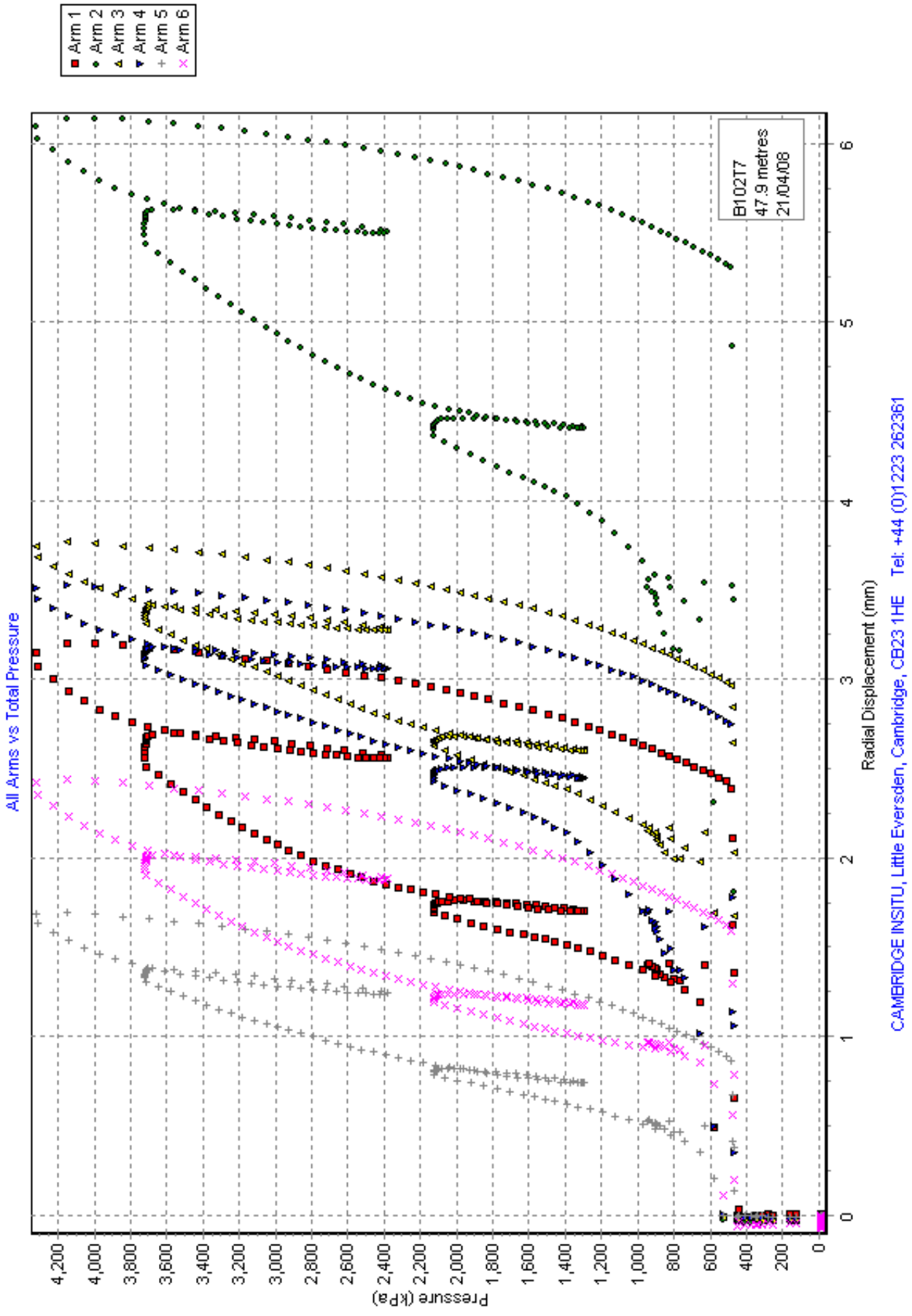
Calibrated Data details:

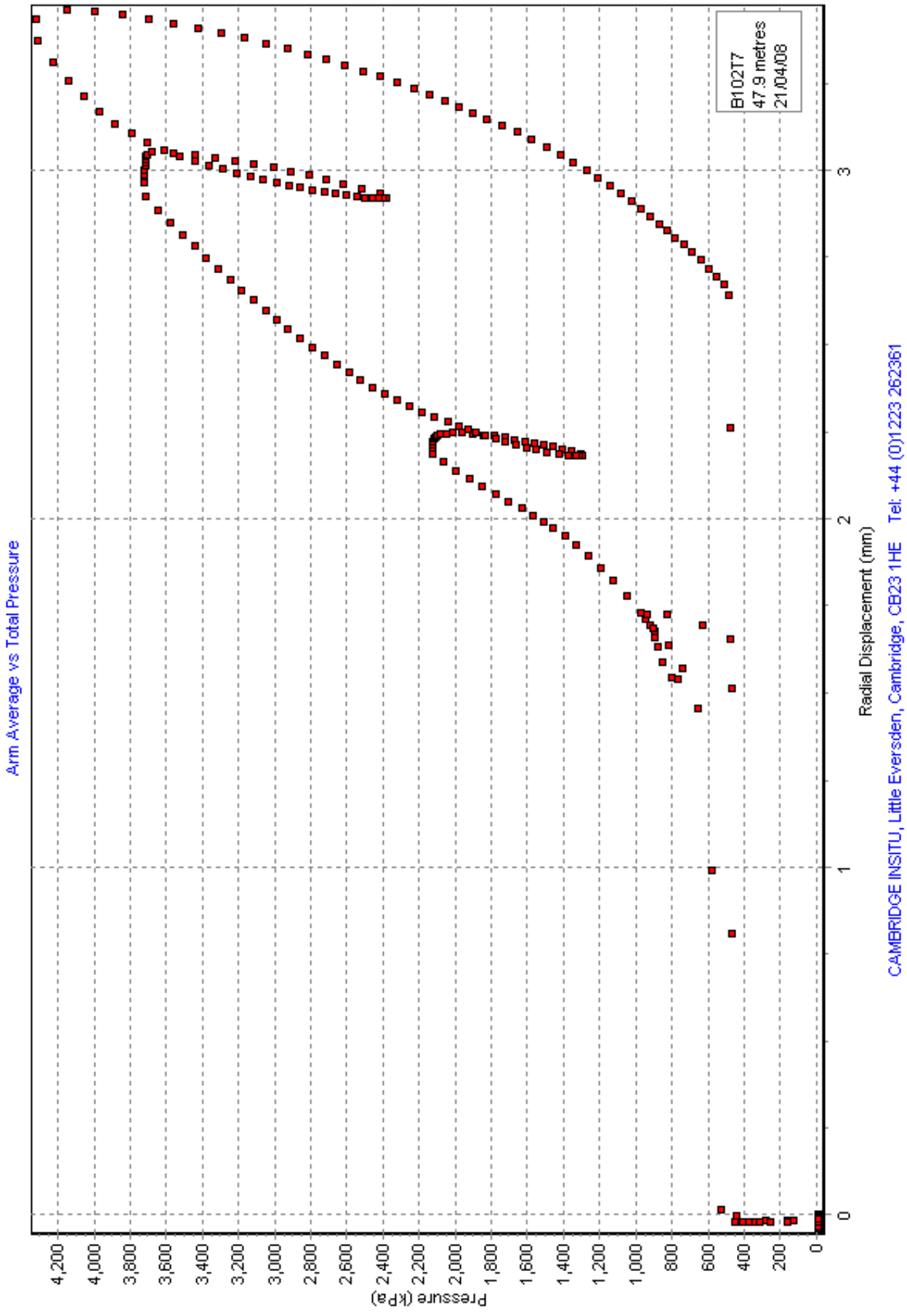
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
W0130T1	W0130T2	10/4/08	11/4/08

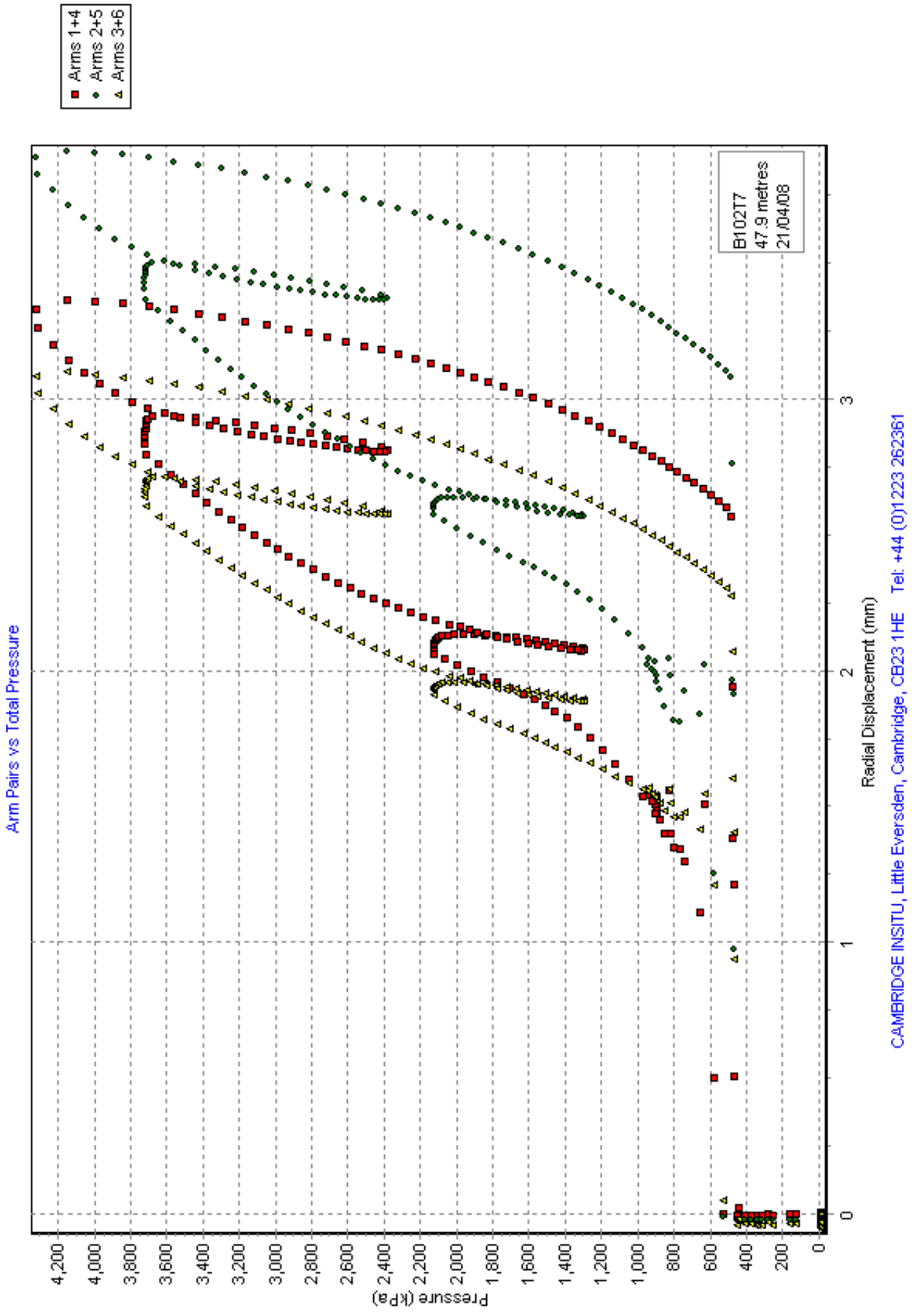
TEST REMARKS: MATERIAL PROBABLY UPPER D.STURRIDGE TEST. SHOE EDGE & CUTTER SEVERELY DAMAGED BY GRAVEL. Apparently no pump. Start of test a bit messy — completed stopped working.

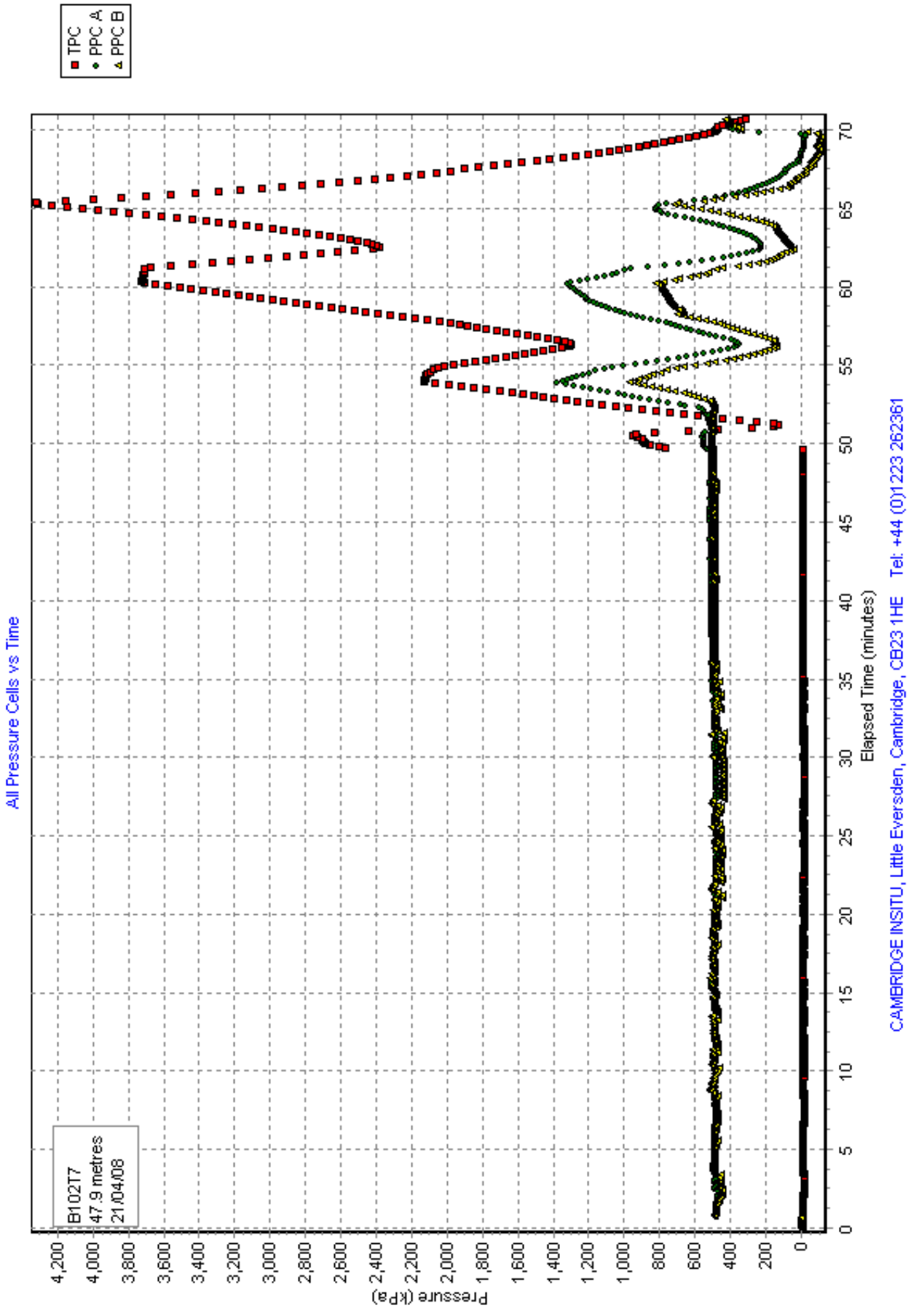
Driller: DAN

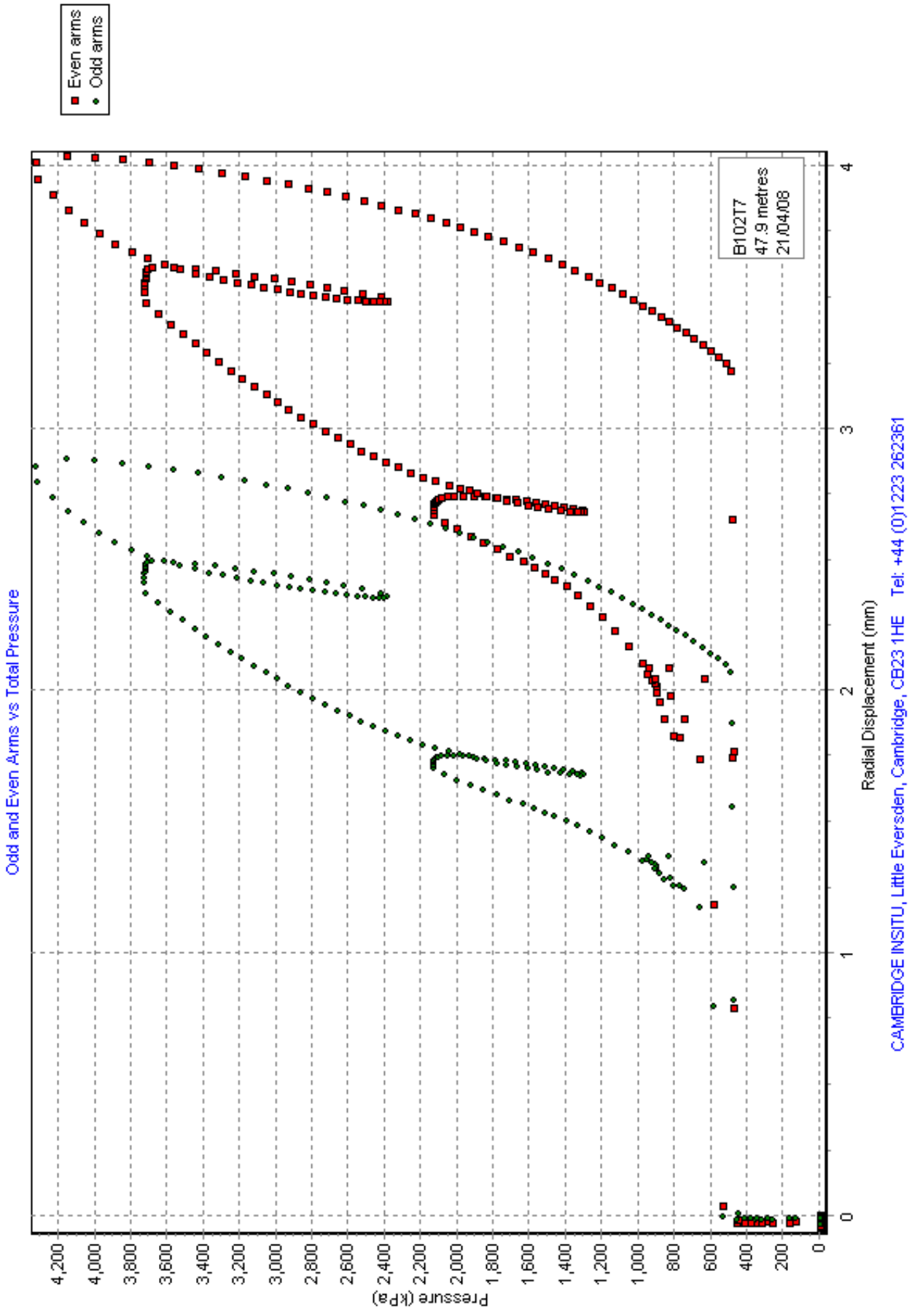
Tester: RWO


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
All Arms vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
B102T7
47.9 metres
21/04/08
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
B10277
47.9 metres
21/04/08
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arms 1+4
Arms 2+5
Arms 3+6
B1027T
47.9 metres
21/04/08
Arm Pairs vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


TPC
PPC A
PPC B
All Pressure Cells vs Time
B102T7
47.9 metres
21/04/08
Pressure (kPa)
Elapsed Time (minutes)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T7
47.9 metres
21/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361

B102T8 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]
Project : 36237
Site : Denmark Place
Borehole : BH102
Test name : B102T8
Test date : 22 Apr 08
Test depth : 50.00 Metres
Water table : 5.6 Metres
Ambient PWP : 0.0 kPa
Material : Thanet Sand
Probe : Digital 6 arm weak rock self boring pressuremeter
Diameter : 88.1 mm
Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out

Analysed by RWW on 5 Jun 08

Remarks: Drilled in quickly, but some gravel in hole so test is disturbed. Some PWP response in

[RESULTS FOR CAVITY REFERENCE PRESSURE]
Strain Origin (mm) : "Arm ave=2.100"
Po from Marsland & Randolph (kPa) : "Arm ave=1089.2"
Best estimate of Po (kPa) : "Arm ave=1089.0"

[UNDRAINED STRENGTH PARAMETERS]
Jefferies 1988 - Cu (kPa) : "Arm ave=960.7"
Undrained yield stress (kPa) : "Arm ave=4309.1"

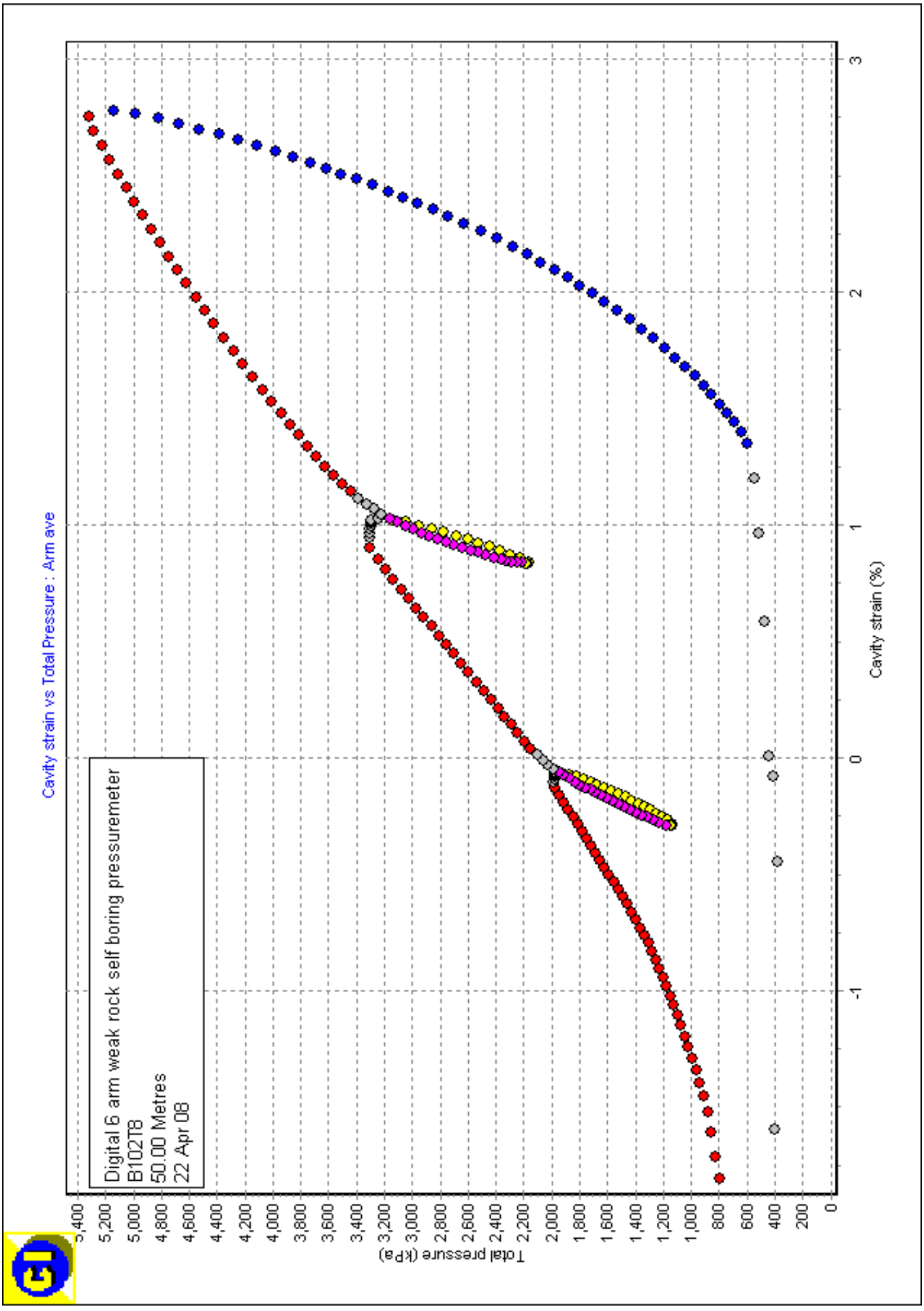
[DRAINED ANALYSIS OF SANDS - HUGHES et al 1977]
Constant volume friction angle (°) : 32.0
Angle of internal friction (°) : "Arm ave=42.3"
Dilation angle (°) : "Arm ave=12.9"
Gradient of log-log plot : "Arm ave=0.492"

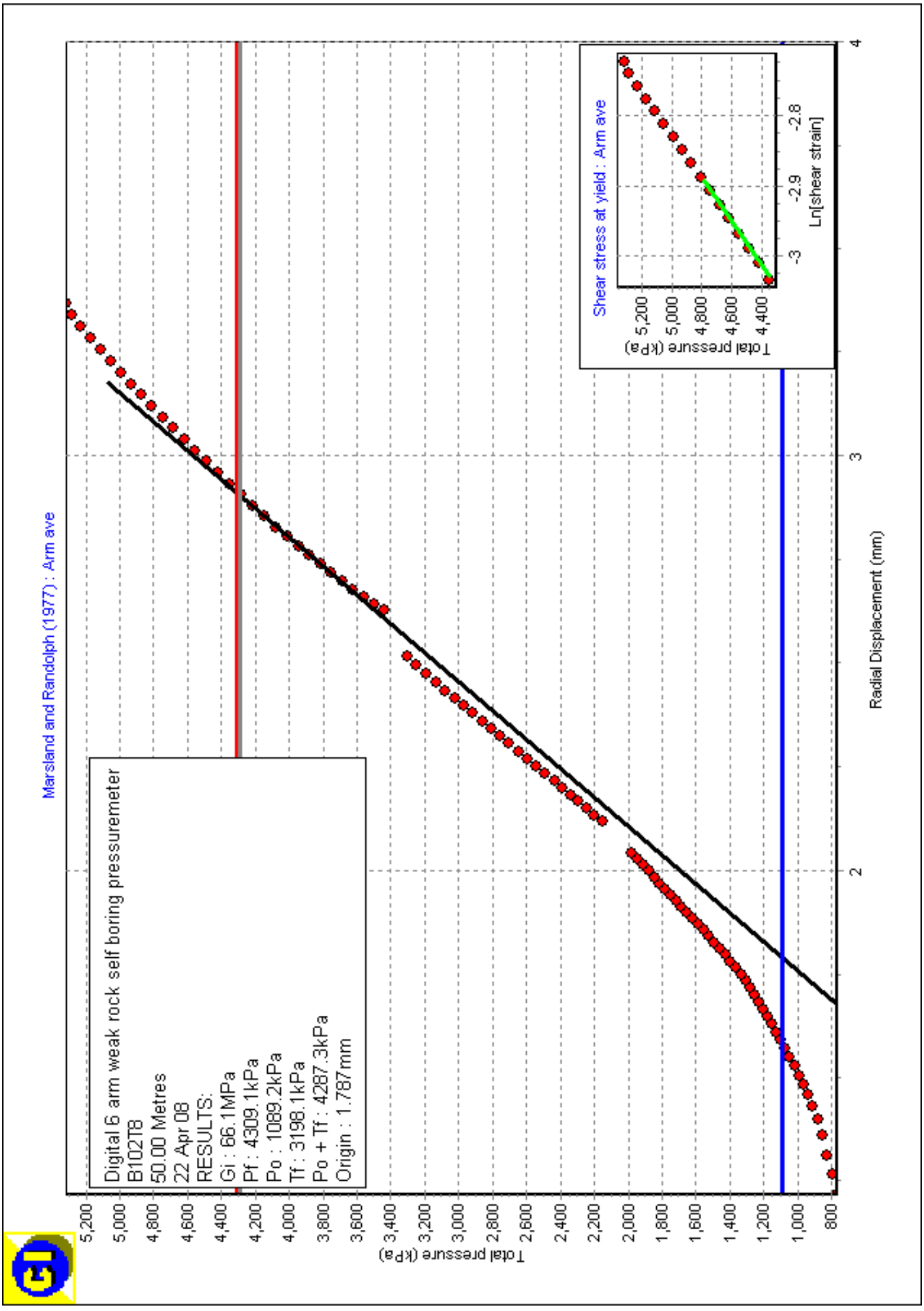
[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=66.1"

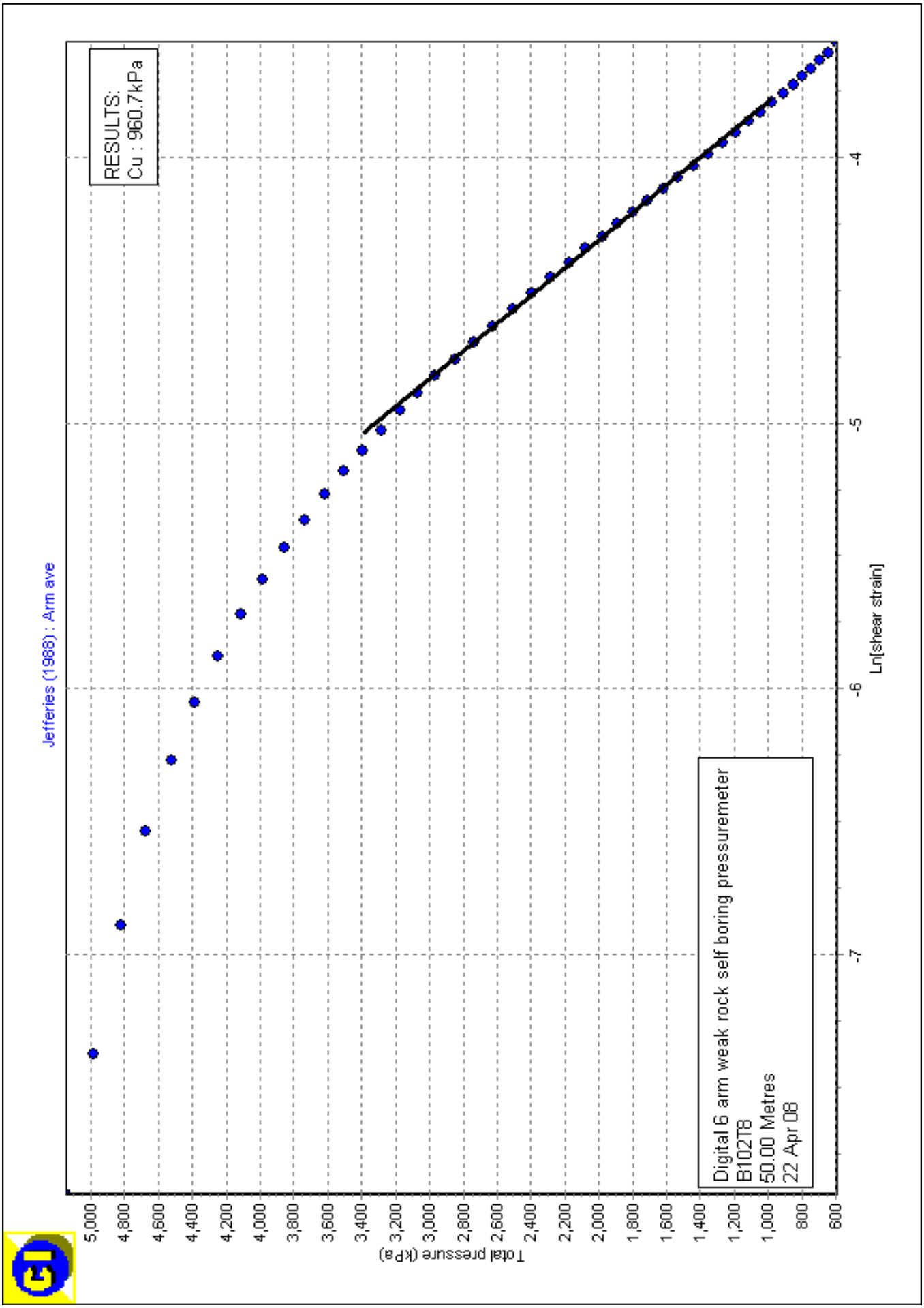
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	175.1	-0.170	1541	0.490	860
Arm ave	2	255.8	0.934	2653	0.402	1030

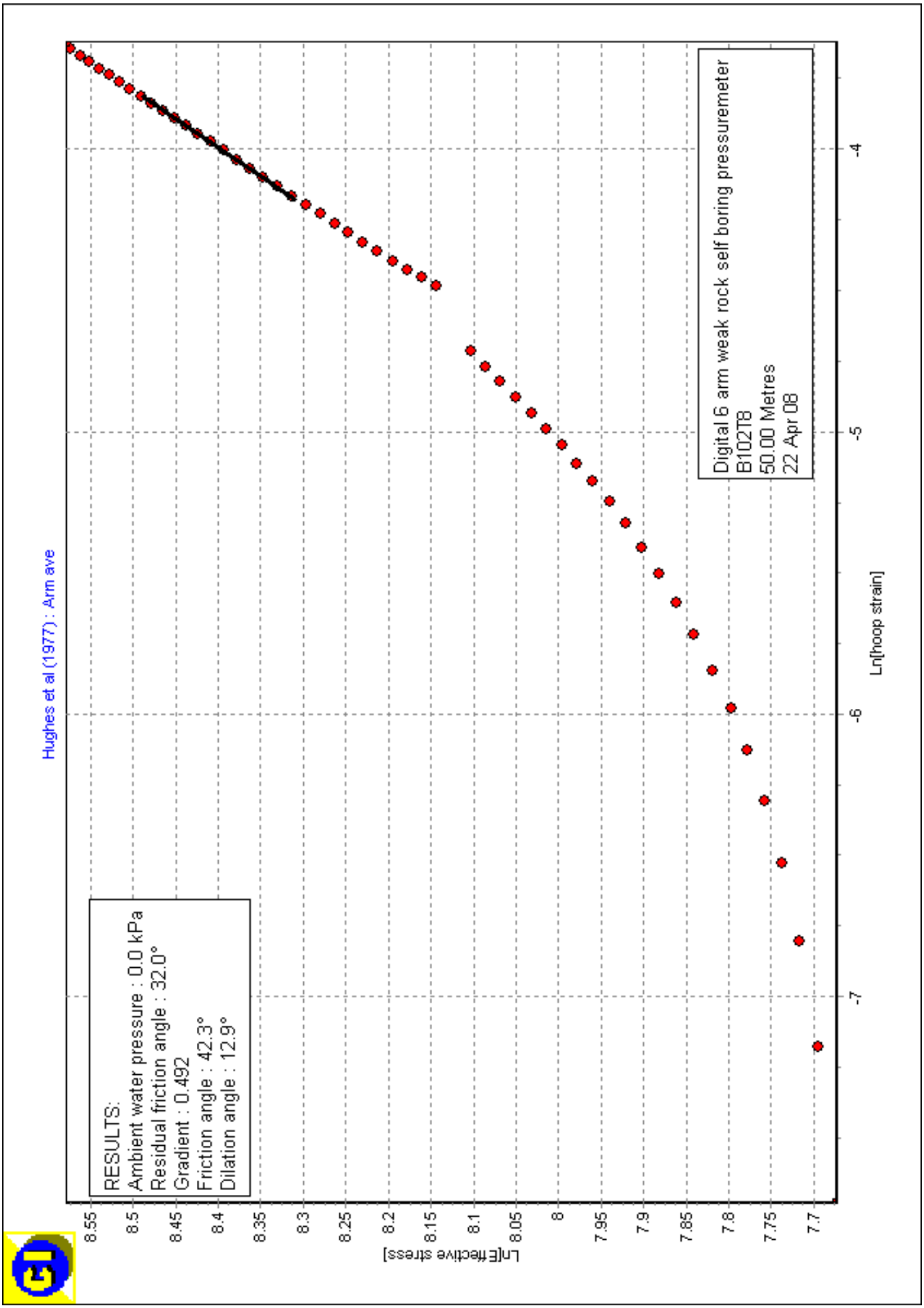
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

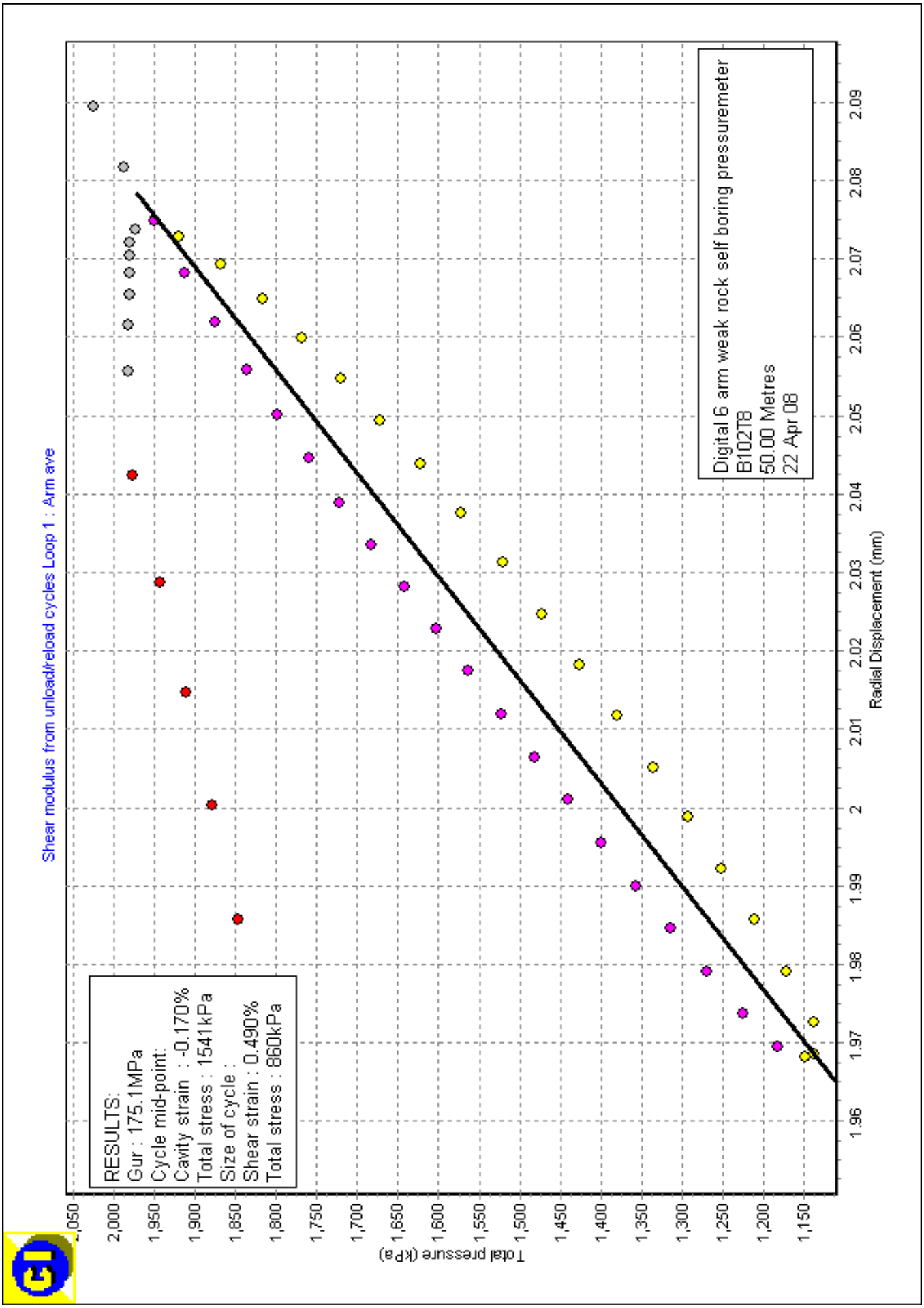
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	86.836	75.547	0.870
Arm ave	2	59.452	43.718	0.735

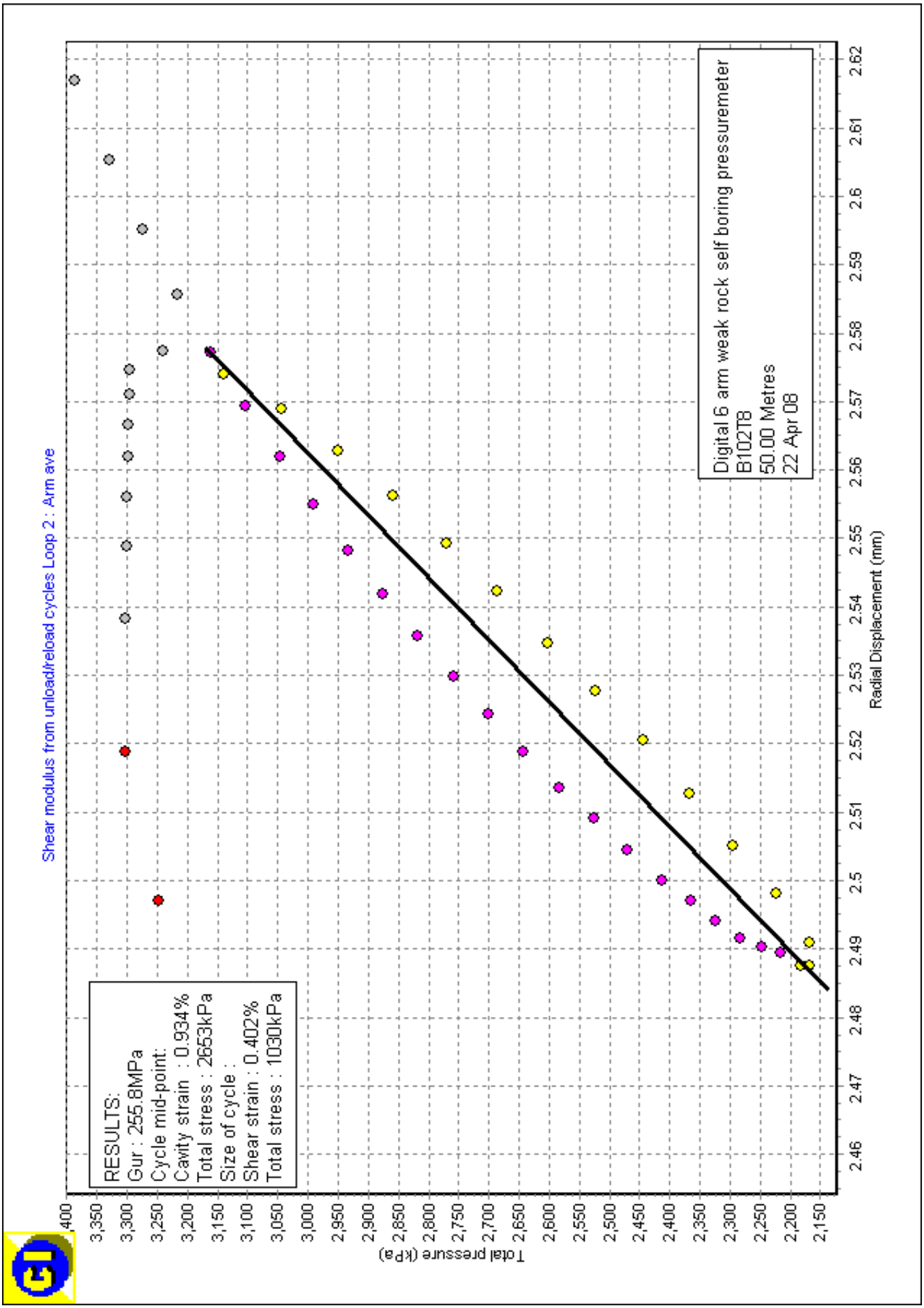

Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08
Total pressure (kPa)
Cavity strain (%)

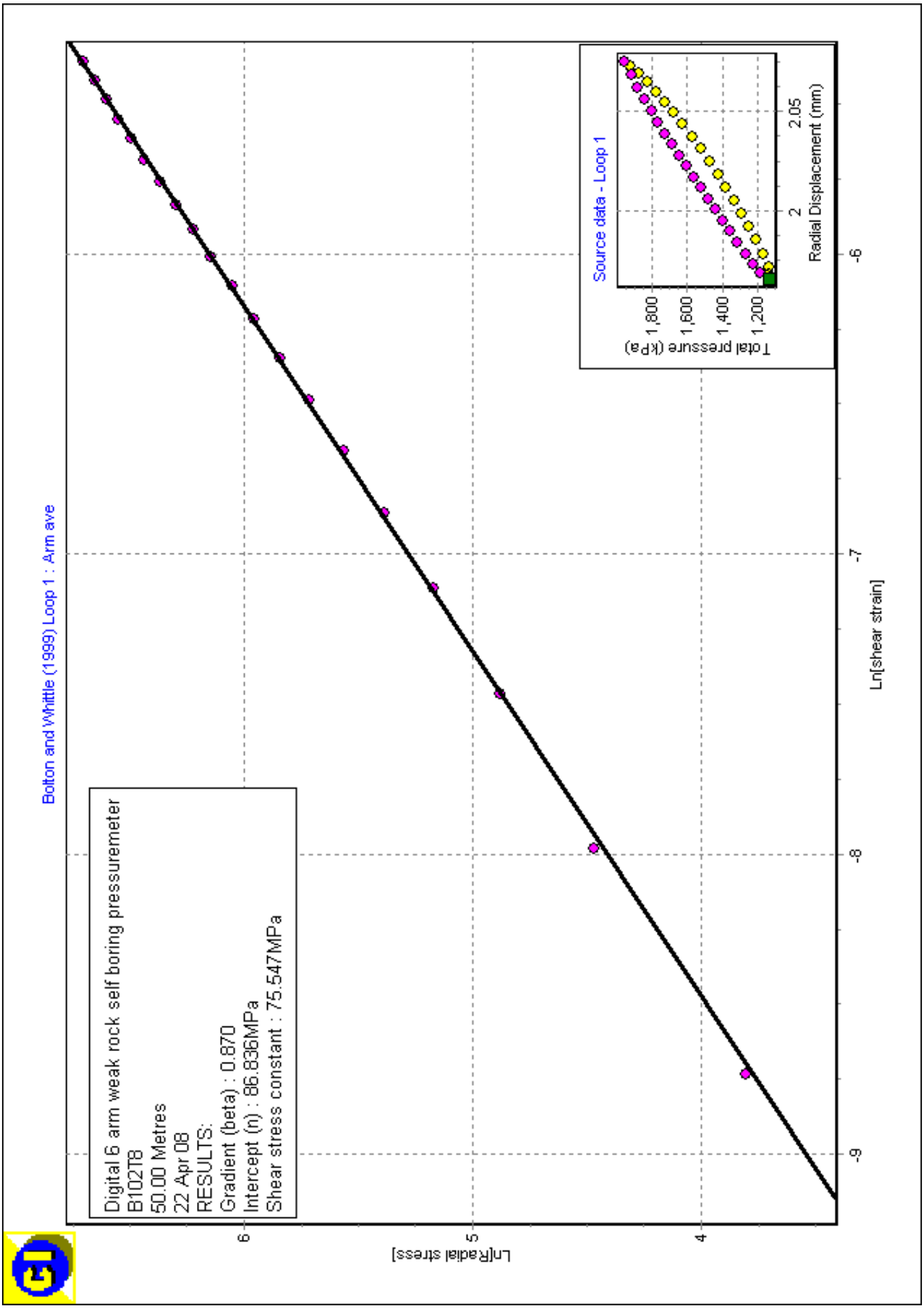

Marsland and Randolph (1977) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08
RESULTS:
Gi : 66.1MPa
Pf : 4309.1kPa
Po : 1089.2kPa
Tf : 3198.1kPa
Po + Tf : 4287.3kPa
Origin : 1.787mm
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]

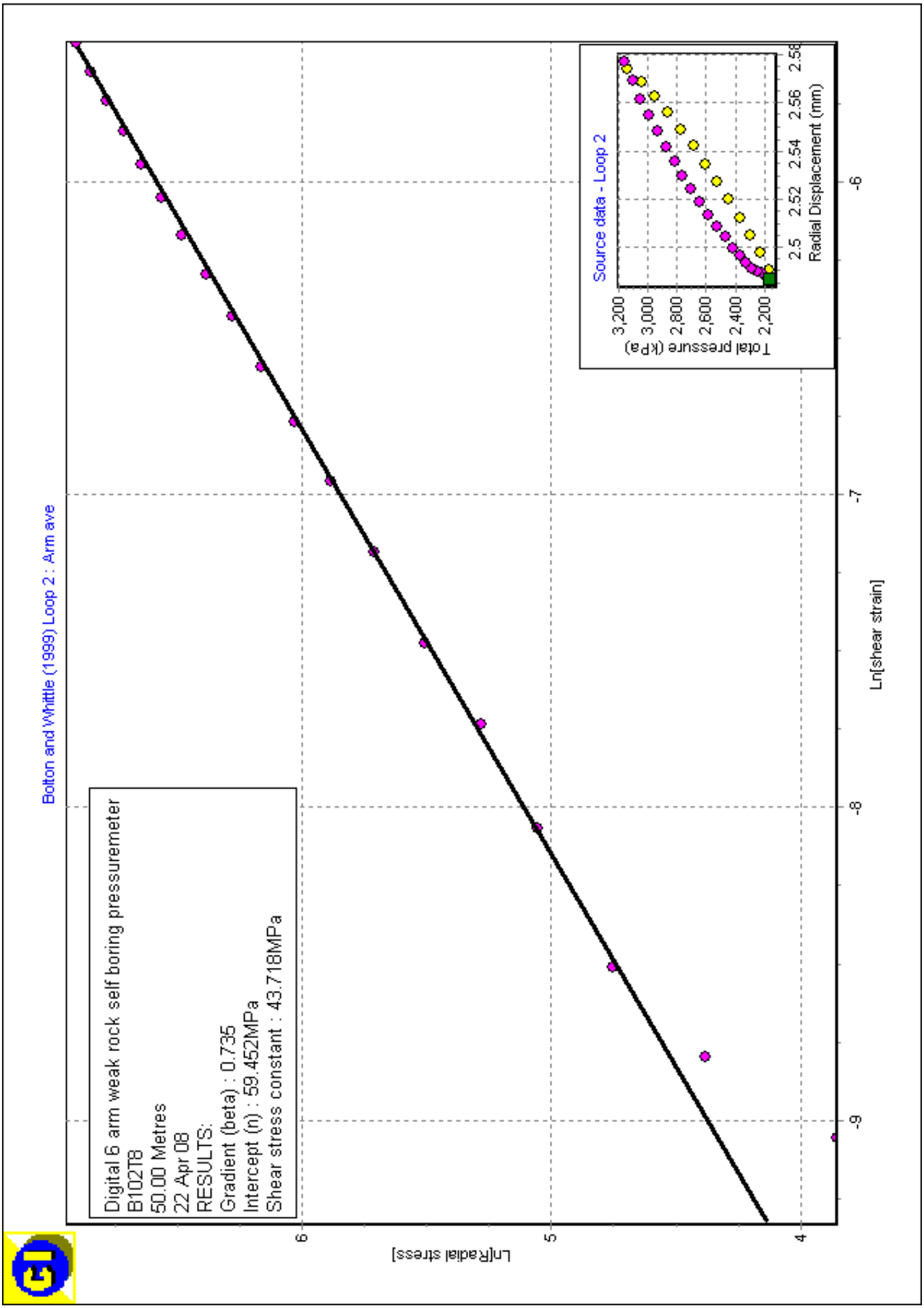

RESULTS:
Cu : 960.7kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08
Total pressure (kPa)
Ln[shear strain]
5,000
4,800
4,600
4,400
4,200
4,000
3,800
3,600
3,400
3,200
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
-4
-5
-6
-7

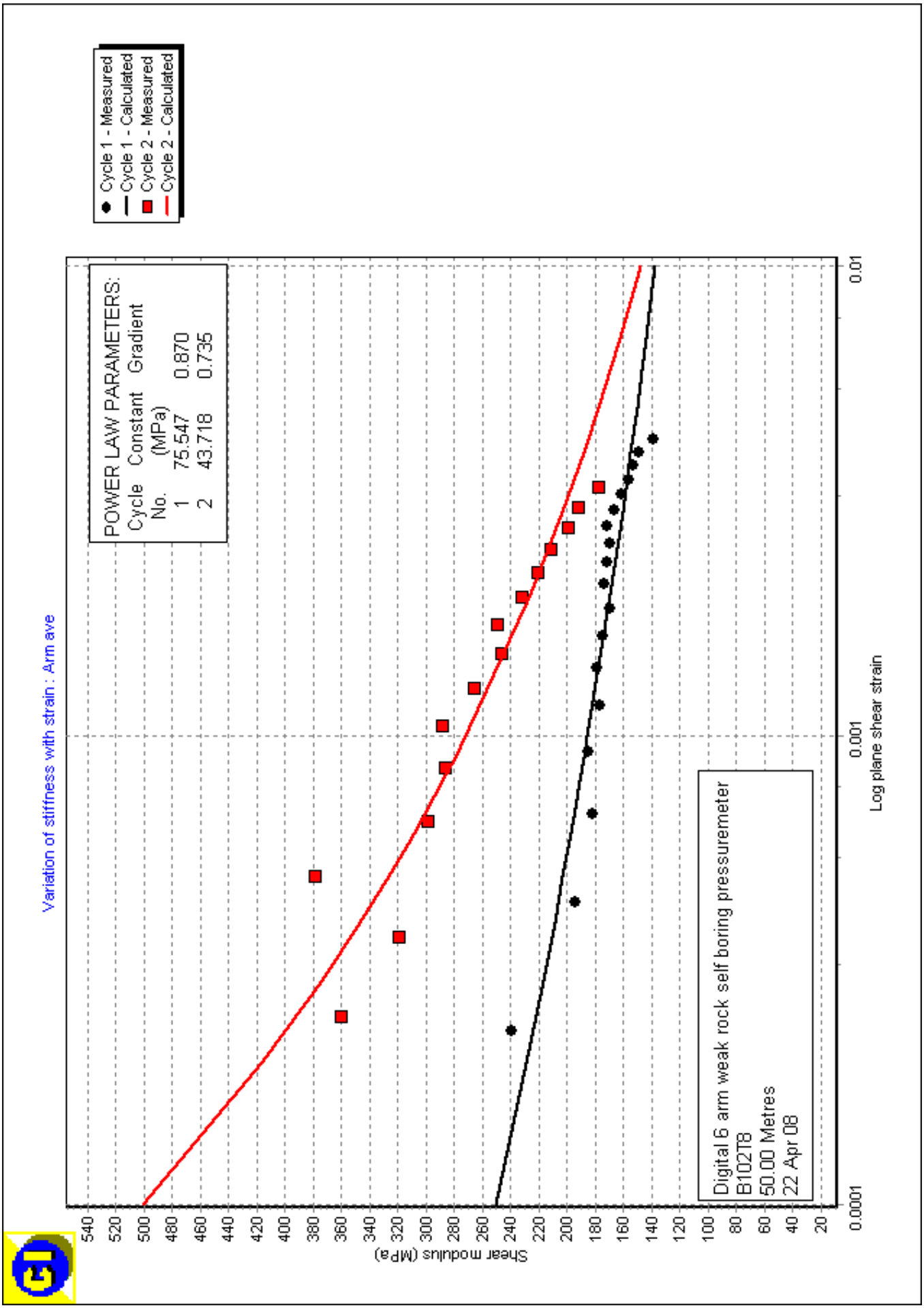

Hughes et al (1977) : Arm ave
RESULTS:
Ambient water pressure : 0.0 kPa
Residual friction angle : 32.0°
Gradient : 0.492
Friction angle : 42.3°
Dilation angle : 12.9°
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08
Ln[Effective stress]
Ln[hoop strain]
8.55
8.5
8.45
8.4
8.35
8.3
8.25
8.2
8.15
8.1
8.05
8
7.95
7.9
7.85
7.8
7.75
7.7
-4
-5
-6
-7


Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 175.1MPa
Cycle mid-point:
Cavity strain : -0.170%
Total stress : 1541kPa
Size of cycle :
Shear strain : 0.490%
Total stress : 860kPa
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08
Total pressure (kPa)
Radial Displacement (mm)

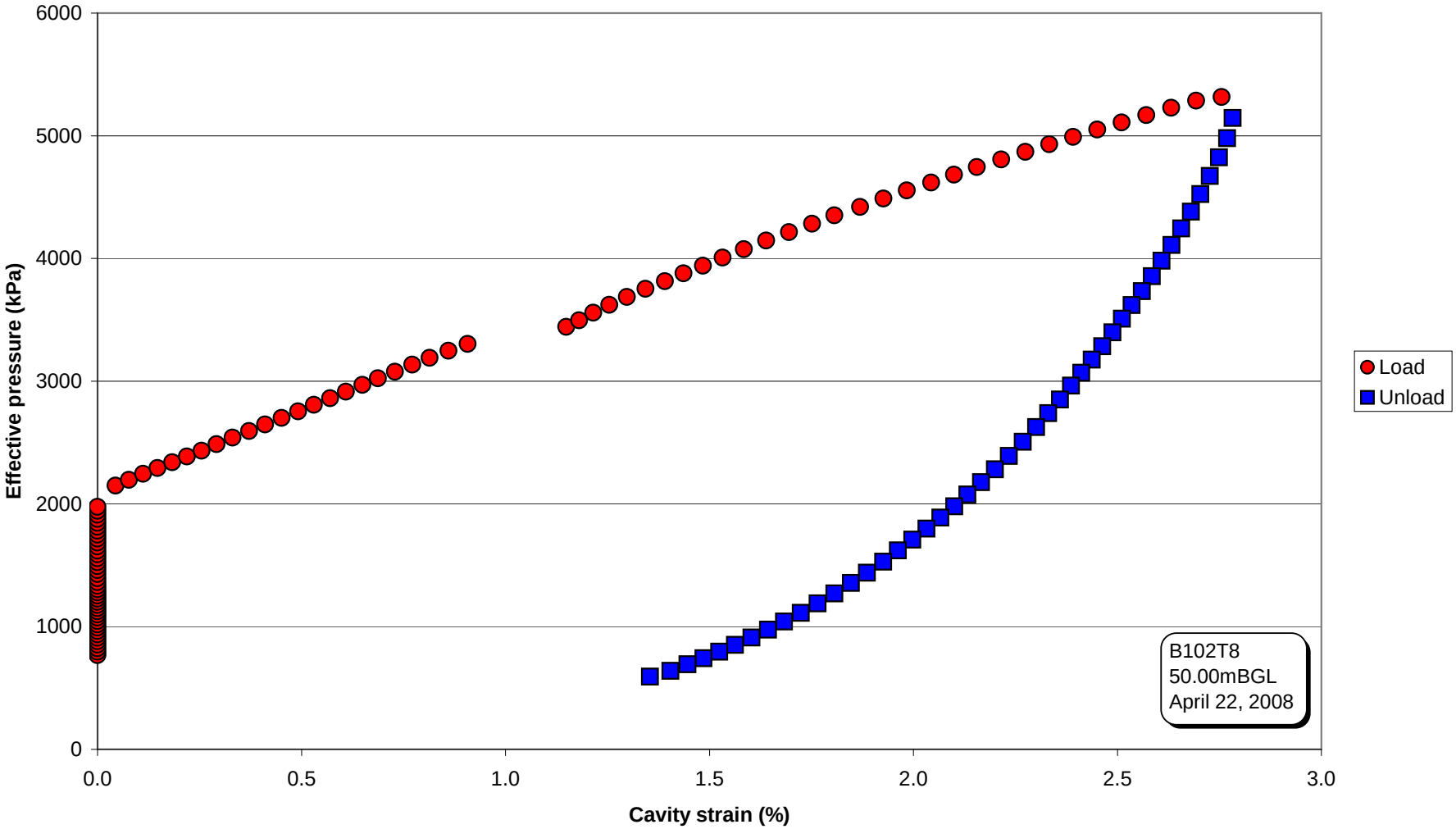

Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 255.8MPa
Cycle mid-point:
Cavity strain : 0.934%
Total stress : 2653kPa
Size of cycle :
Shear strain : 0.402%
Total stress : 1030kPa
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08
RESULTS:
Gradient (beta) : 0.870
Intercept (n) : 86.836MPa
Shear stress constant : 75.547MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 1
Total pressure (kPa)
Radial Displacement (mm)

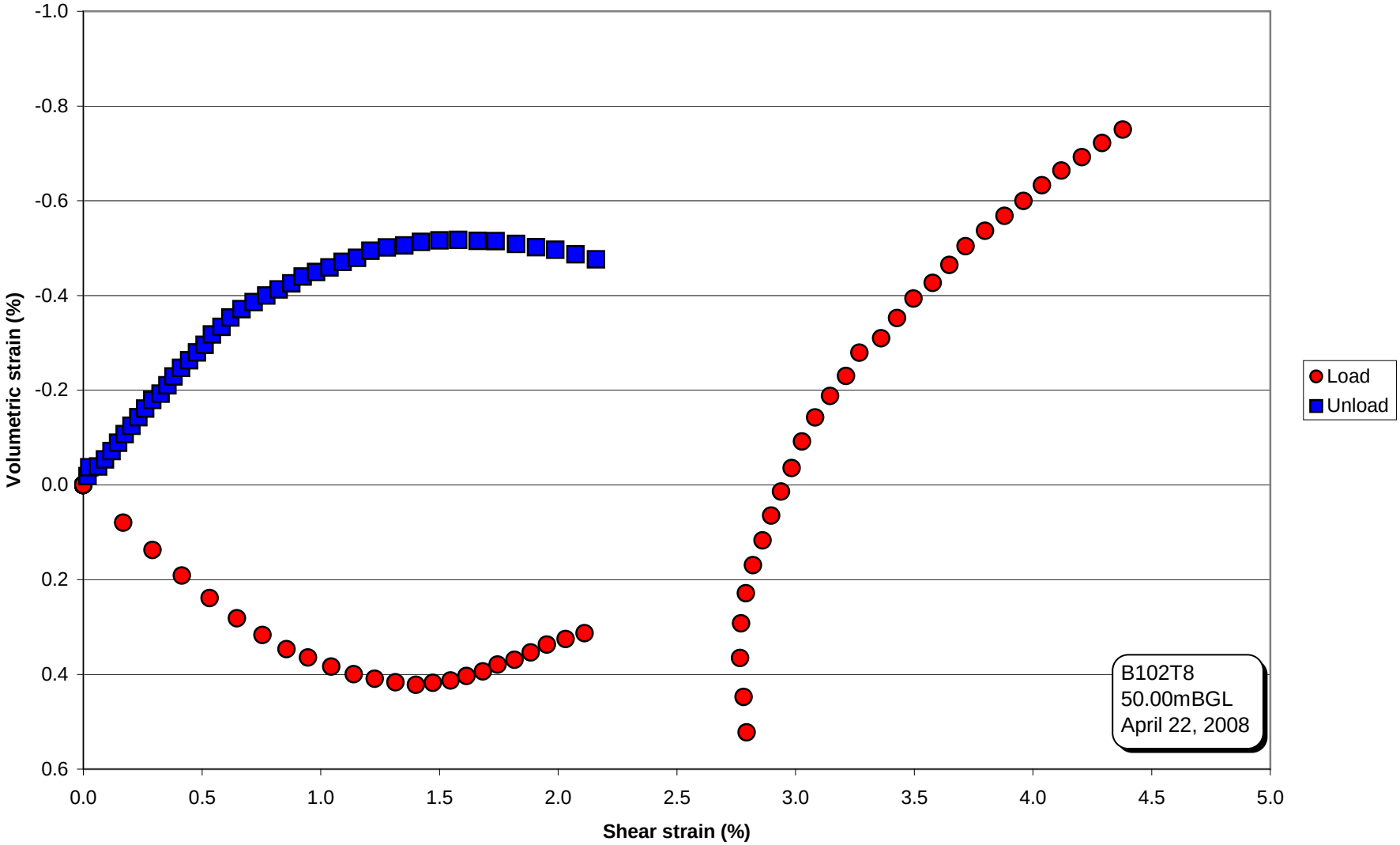

Bolton and Whittle (1999) Loop 2 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08
RESULTS:
Gradient (beta) : 0.735
Intercept (n) : 59.452MPa
Shear stress constant : 43.718MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)


Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
POWER LAW PARAMETERS:
Cycle No. Constant (MPa) Gradient
1 75.547 0.870
2 43.718 0.735
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
Digital 6 arm weak rock self boring pressuremeter
B102T8
50.00 Metres
22 Apr 08

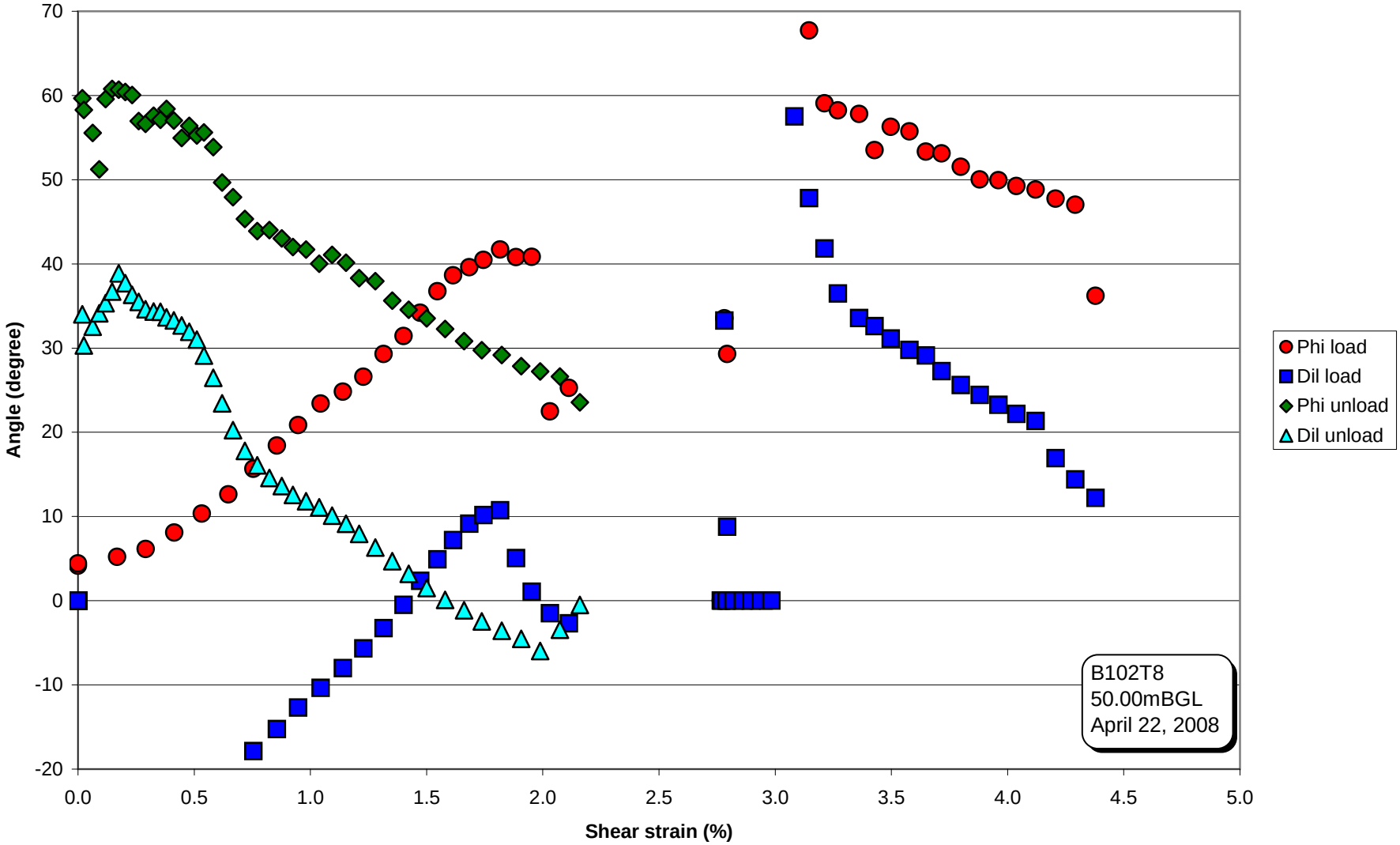
Effective pressure vs Cavity strain



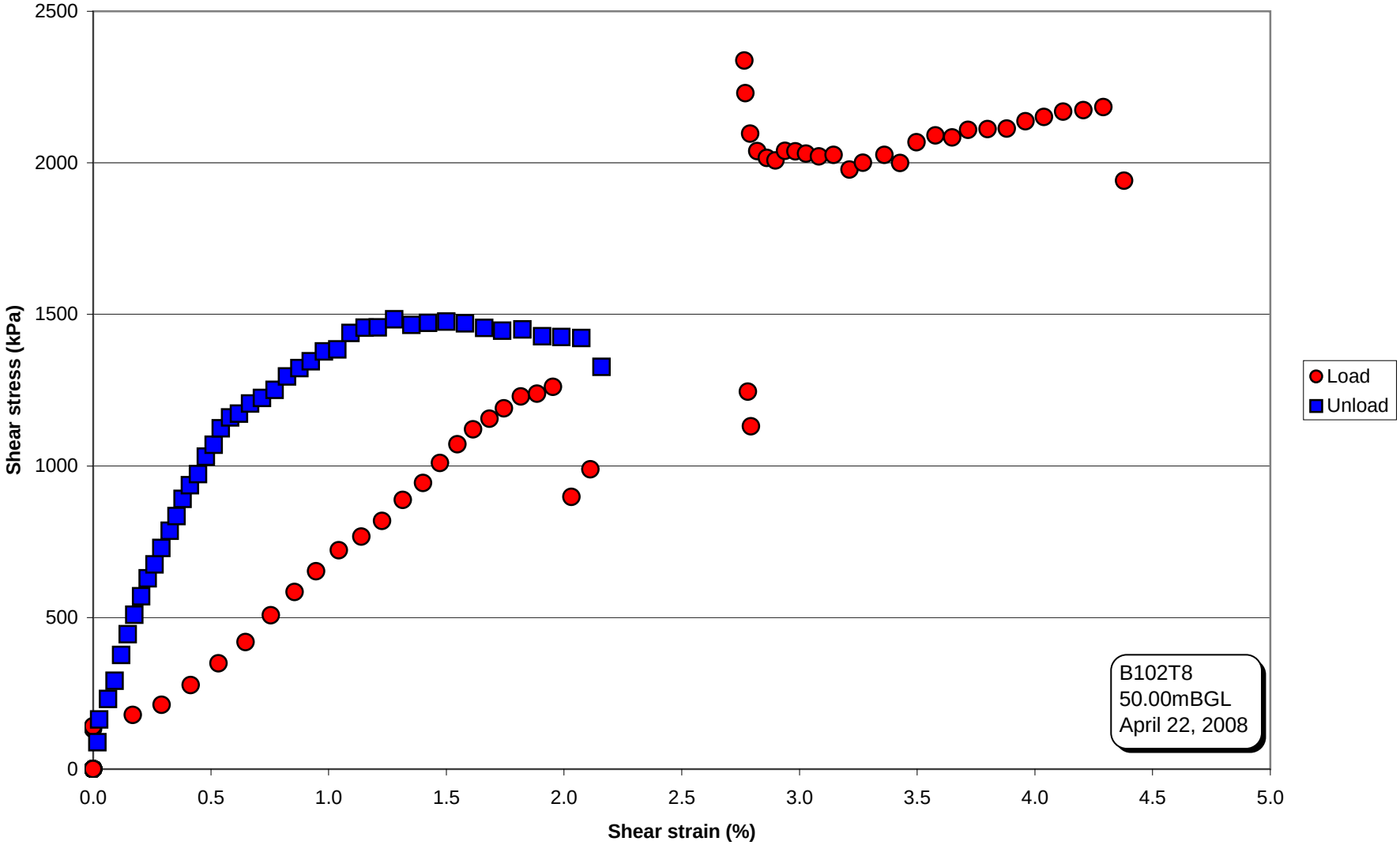
Volumetric strain vs Shear strain

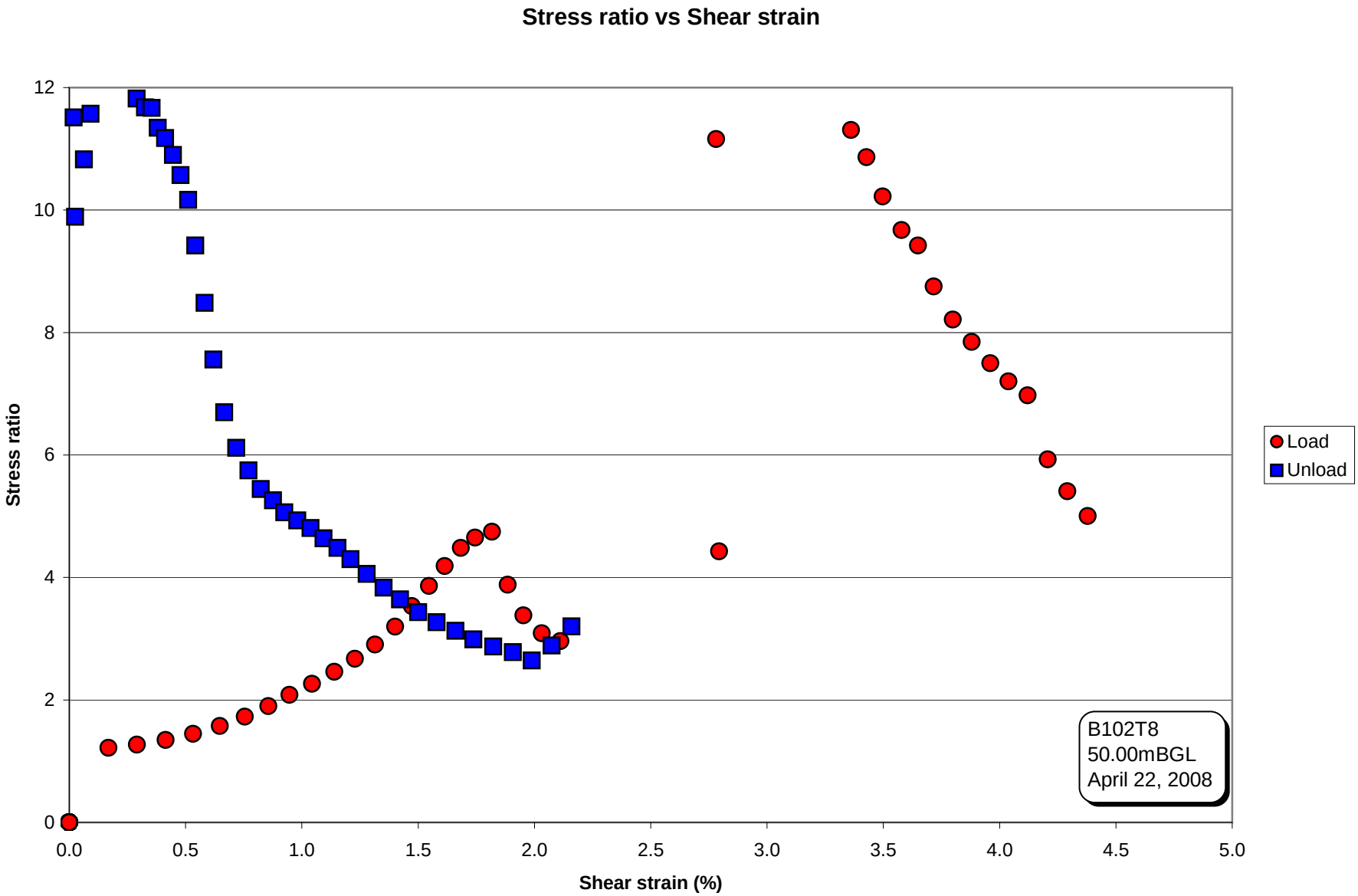


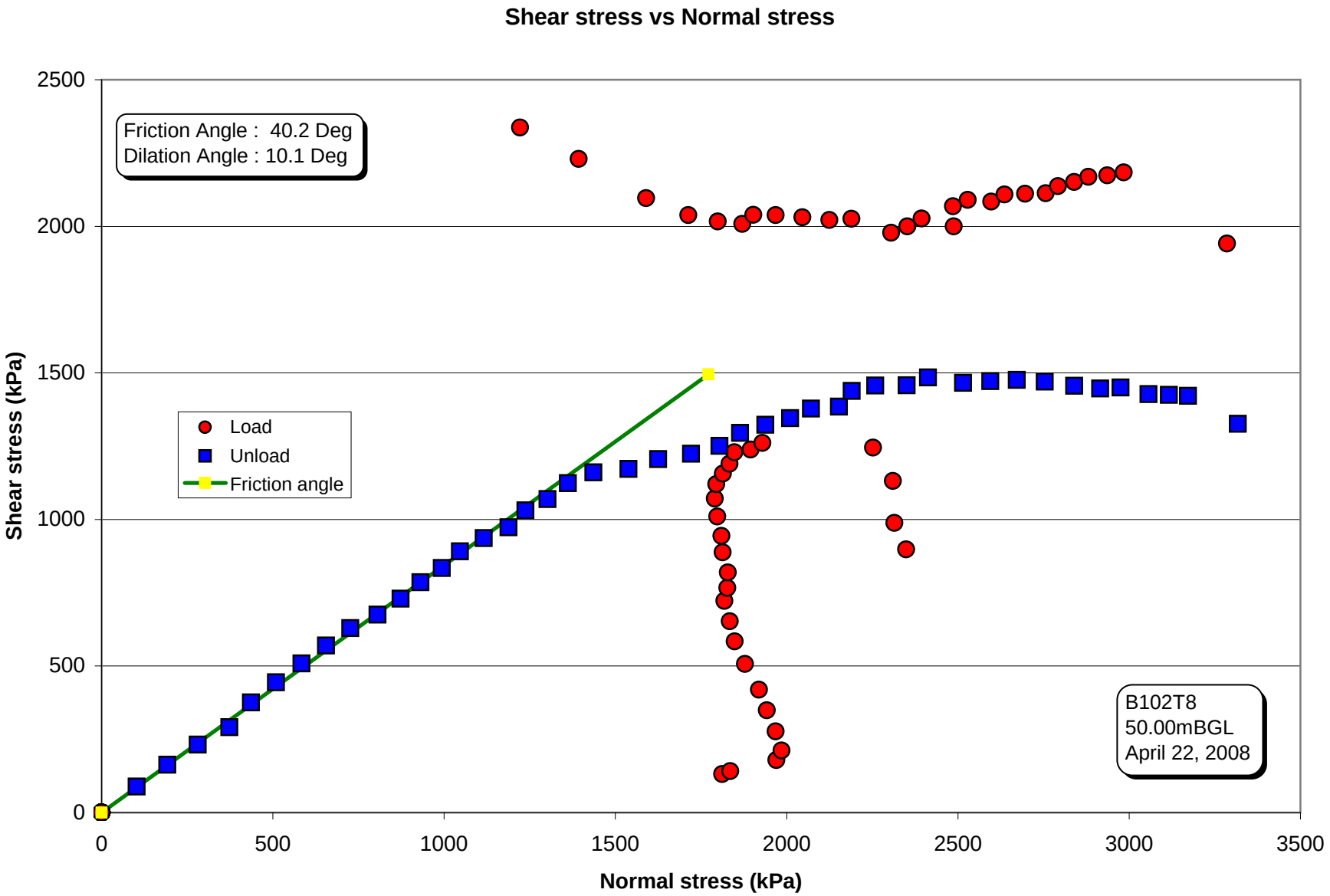
Angles of friction and dilation vs Shear strain



Shear stress vs Shear strain




Stress ratio vs Shear strain
Stress ratio
Shear strain (%)
0
2
4
6
8
10
12
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Load
Unload
B102T8
50.00mBGL
April 22, 2008


Shear stress vs Normal stress
Friction Angle : 40.2 Deg
Dilation Angle : 10.1 Deg
Load
Unload
Friction angle
B102T8
50.00mBGL
April 22, 2008
Shear stress (kPa)
Normal stress (kPa)
0
500
1000
1500
2000
2500
3000
3500

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
DENMARK PLACE	22/4/08	TUES	B102	8	2 50m.

Weather:-	Material:-
OVERCAST.	THANET SAND.

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
?	15:30	15:37	1m.	1m/7m.in.	150 BARS.

Ground level :-	Orientation:-
NK.	NR.

Water Press.	Inst.OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
180	88.1	89.1	73 RR	3mm	'Mary'

Drilling Remarks:-

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
— MANUAL —		6 SEC	250 BAR.	12.9	TRIAX	10MP.

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-105	82	-64	+34	-80	133	-1035	-931	-2445	Ground Level Zeros
									Pre-drilling Zeros
									Post-drilling Zeros
-116	76	-71	41	-86	117	-908	-817	-2447	Pre-test Zeros
									Ground Level Zeros

Test starts:- 15:38.

Line	Notes
147	Held 2MP.
153	Loop 1 q = 186MP.
221	Held 3.3MP.
228	Loop 2. q = 291 MP.
298	unload
	Test ends:- 16:06. Max Press:- 535 kPa

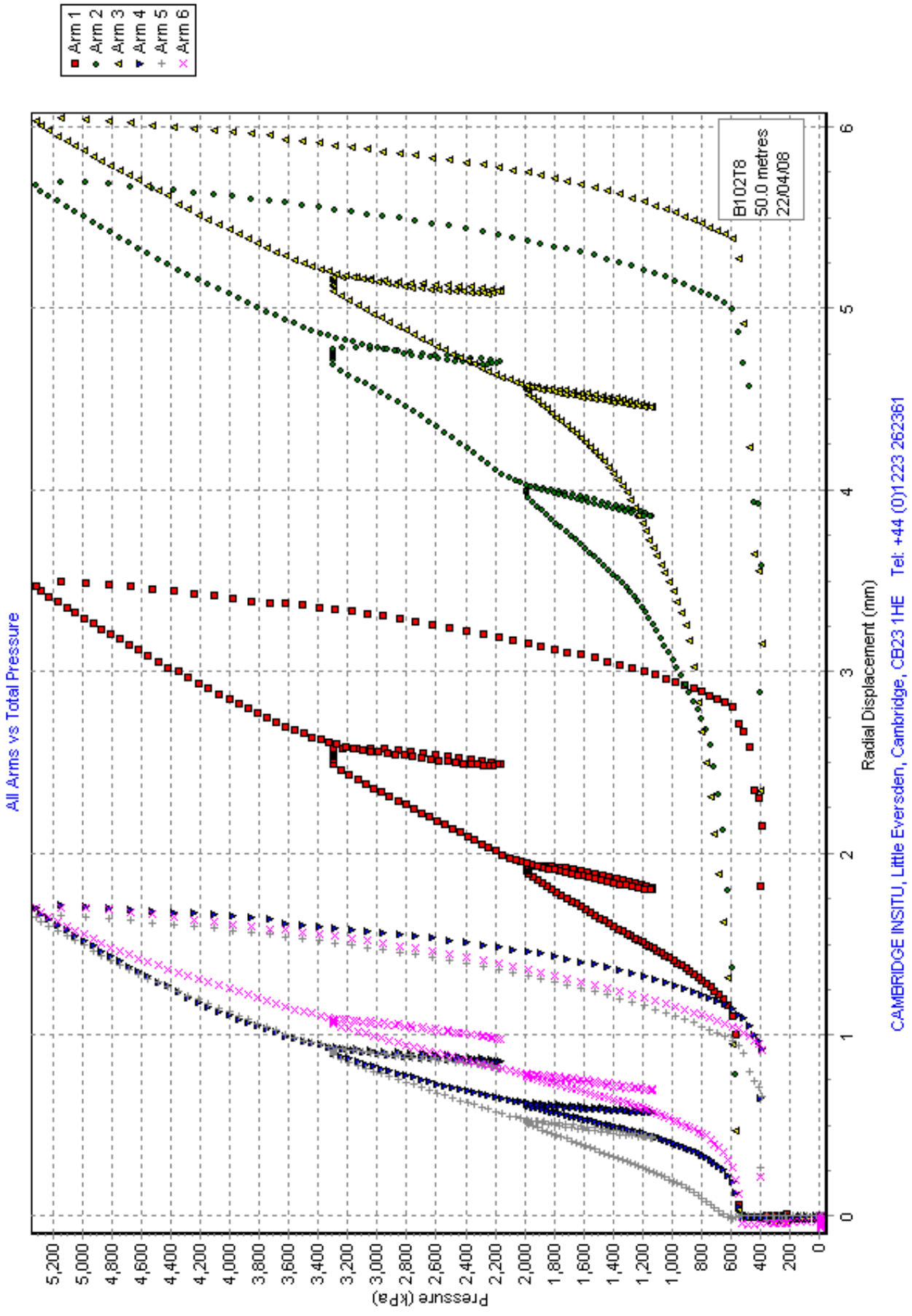
Calibrated Data details:

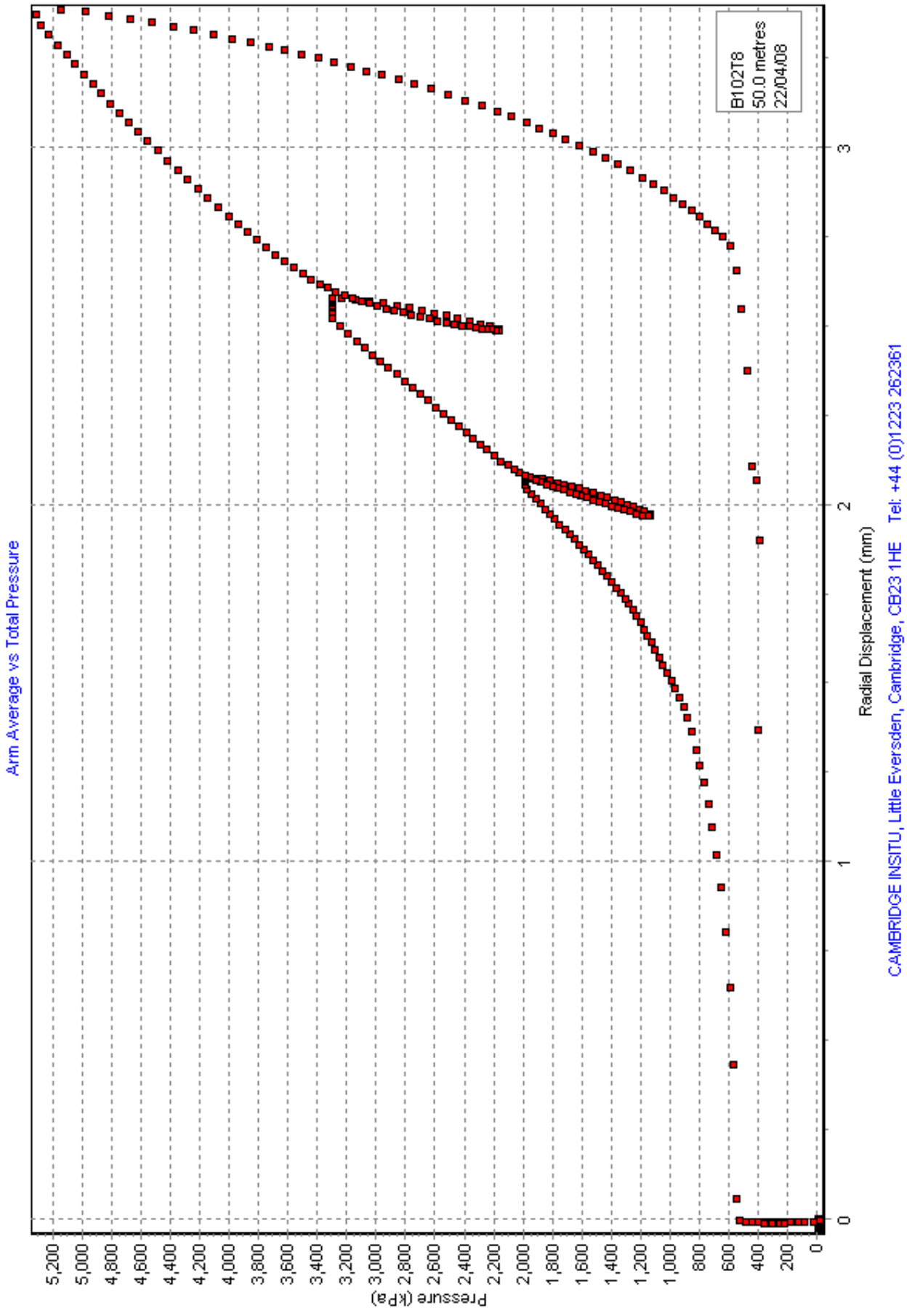
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
WOLSOTT	WOLSOTT2	10/4/08	11/4/08

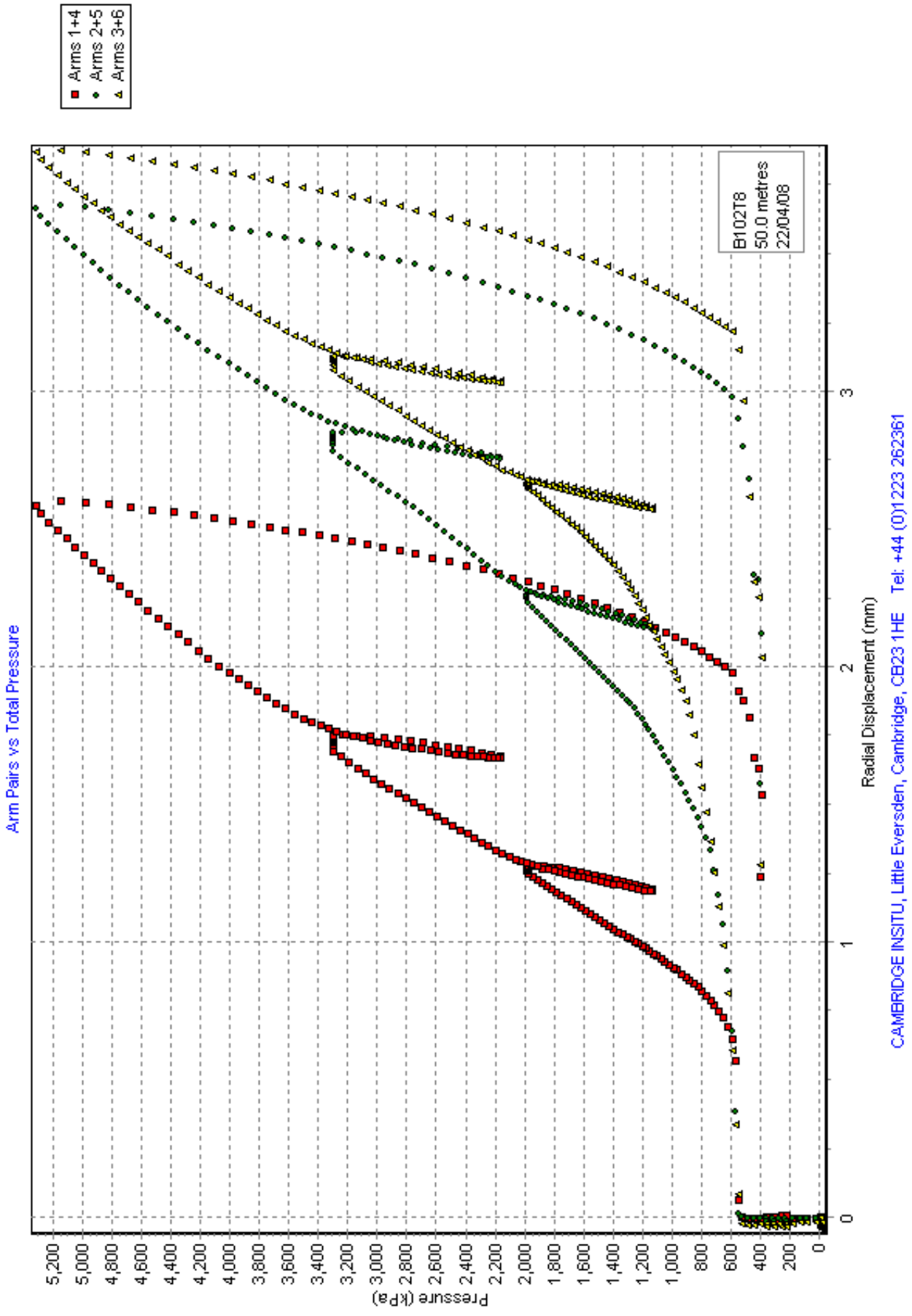
TEST REMARKS: Drilled in very quickly, but some gravel in hole - from above? Hence significant disturbance at start, & run out of expansion capability. NOTE PWP RESPONSE in PLASTIC PHASE.

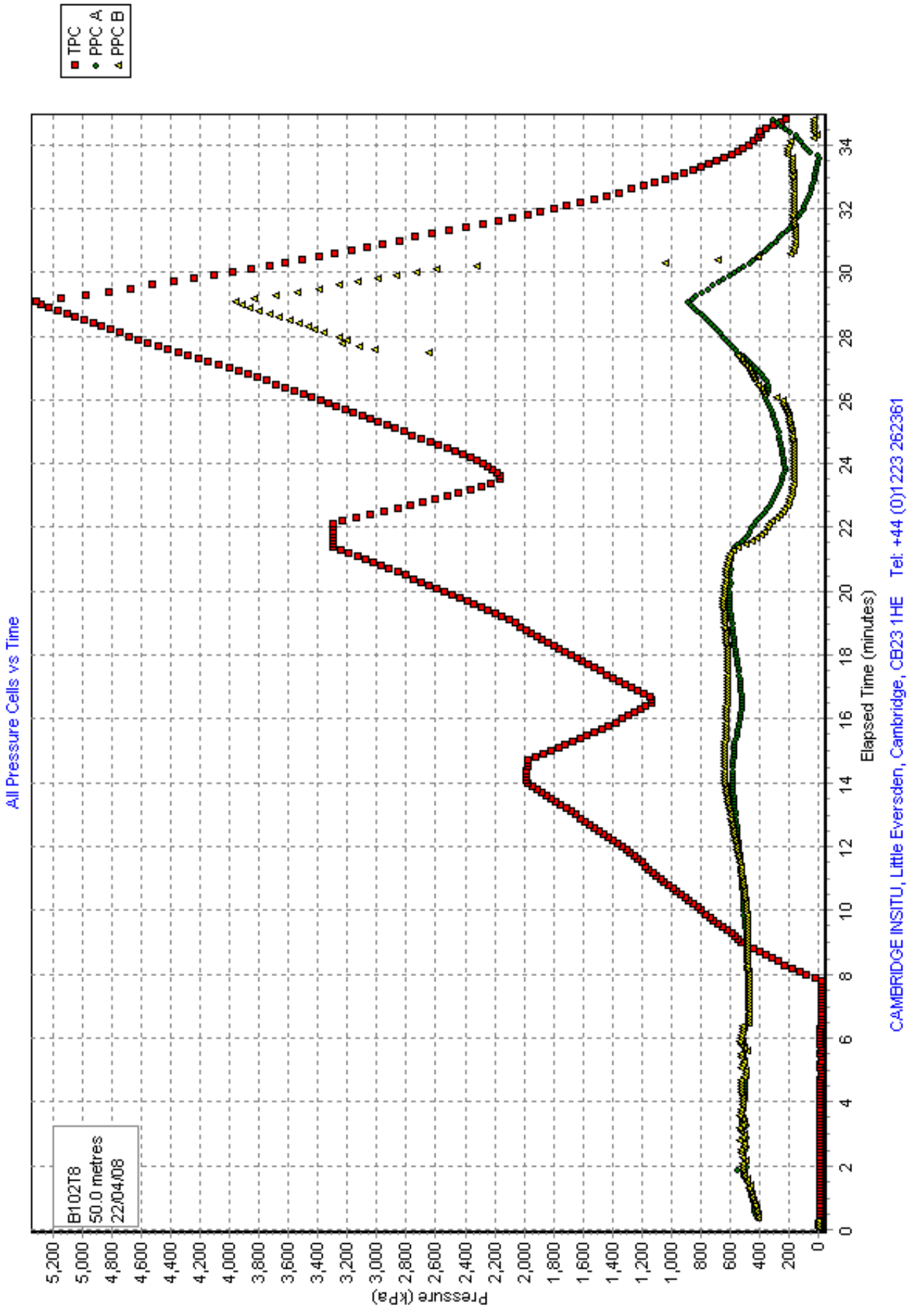
Driller: DAN

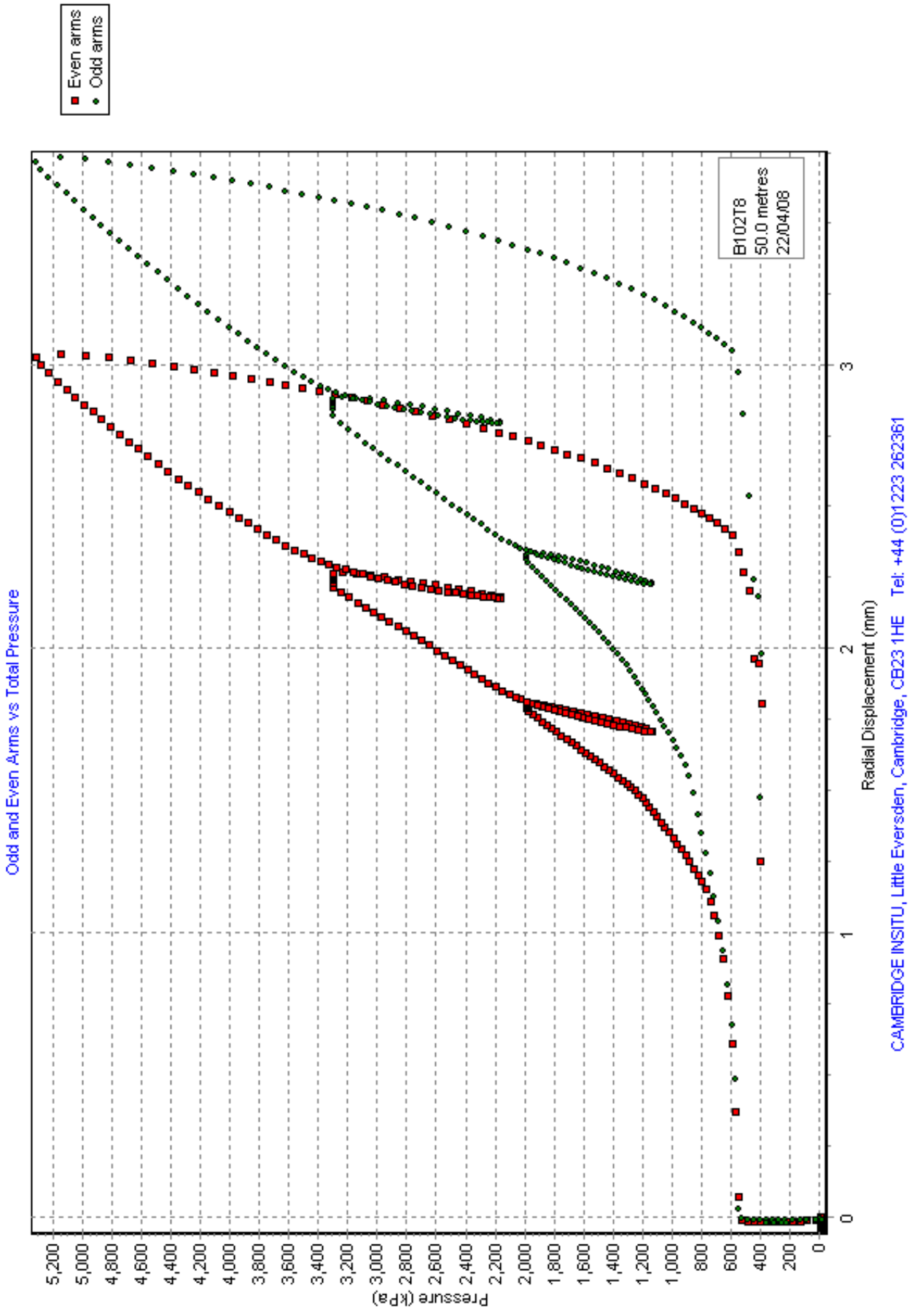
Tester: RD


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
B102T8
50.0 metres
22/04/08
All Arms vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
B102T8
50.0 metres
22/04/08
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arms 1+4
Arms 2+5
Arms 3+6
B102T8
50.0 metres
22/04/08
Arm Pairs vs Total Pressure
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


TPC
PPC A
PPC B
All Pressure Cells vs Time
B102T8
50.0 metres
22/04/08
Pressure (kPa)
Elapsed Time (minutes)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T8
50.0 metres
22/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361

B102T9 - SUMMARY OF RESULTS
[File made with WinSitu Version 1.20.1.1]

[DETAILS OF TEST]
Project : 36237
Site : Denmark Place
Borehole : BH102
Test name : B102T9
Test date : 22 Apr 08
Test depth : 51.00 Metres
Water table : 5.6 Metres
Ambient PWP : 0.0 kPa
Material : Thanet Sand
Probe : Digital 6 arm weak rock self boring pressuremeter
Diameter : 88.1 mm
Data analysed using average arm displacement curve
A non-linear analysis of the rebound cycles has been carried out

Analysed by RWW on 5 Jun 08

Remarks: Nice test

[RESULTS FOR CAVITY REFERENCE PRESSURE]
Strain Origin (mm) : "Arm ave=0.674"
Po from Marsland & Randolph (kPa) : "Arm ave=1434.3"
Best estimate of Po (kPa) : "Arm ave=1434.0"

[UNDRAINED STRENGTH PARAMETERS]
Jefferies 1988 - Cu (kPa) : "Arm ave=1518.6"
Undrained yield stress (kPa) : "Arm ave=3023.8"

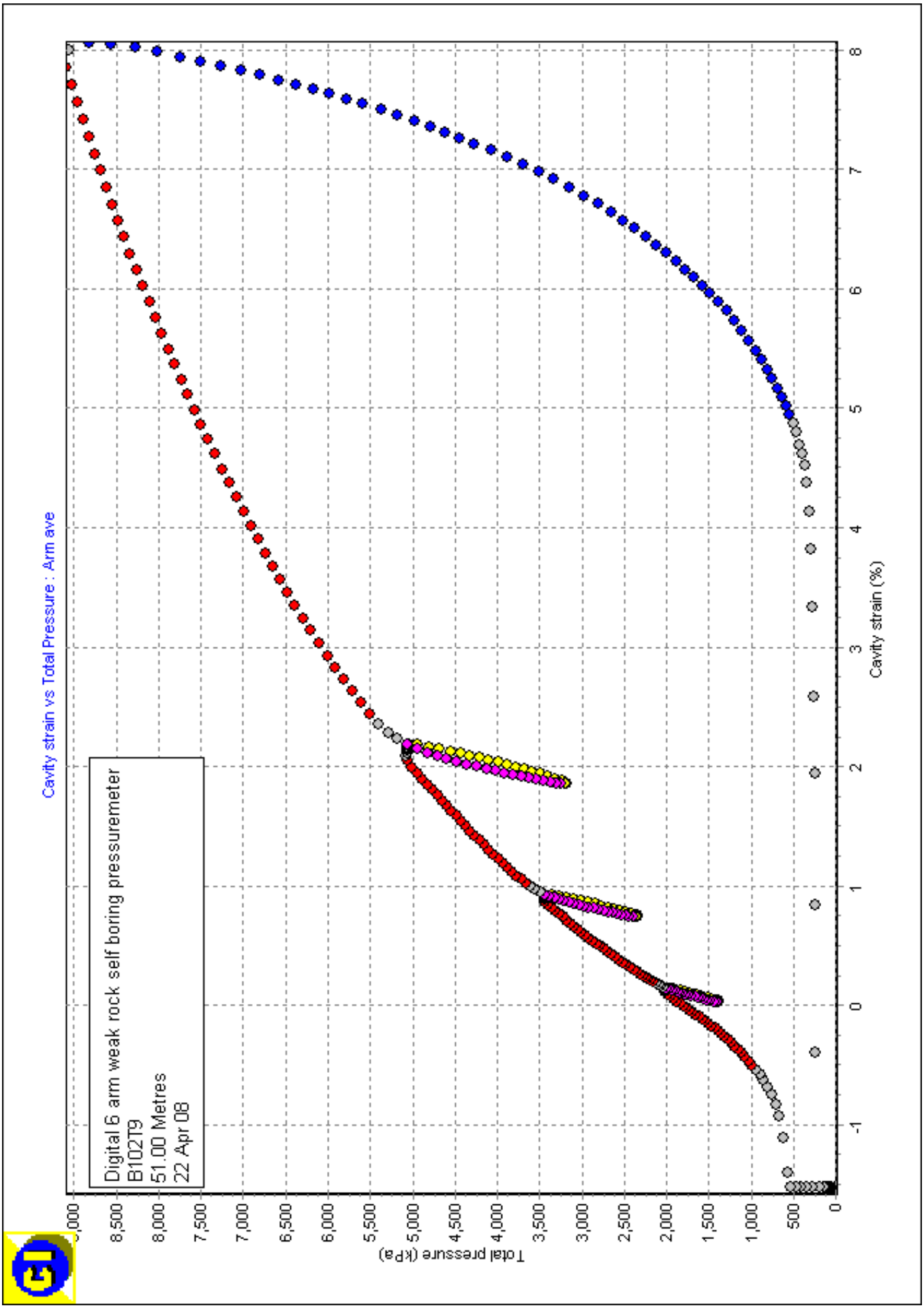
[DRAINED ANALYSIS OF SANDS - HUGHES et al 1977]
Constant volume friction angle (°) : 32.0
Angle of internal friction (°) : "Arm ave=38.2"
Dilation angle (°) : "Arm ave=7.6"
Gradient of log-log plot : "Arm ave=0.432"

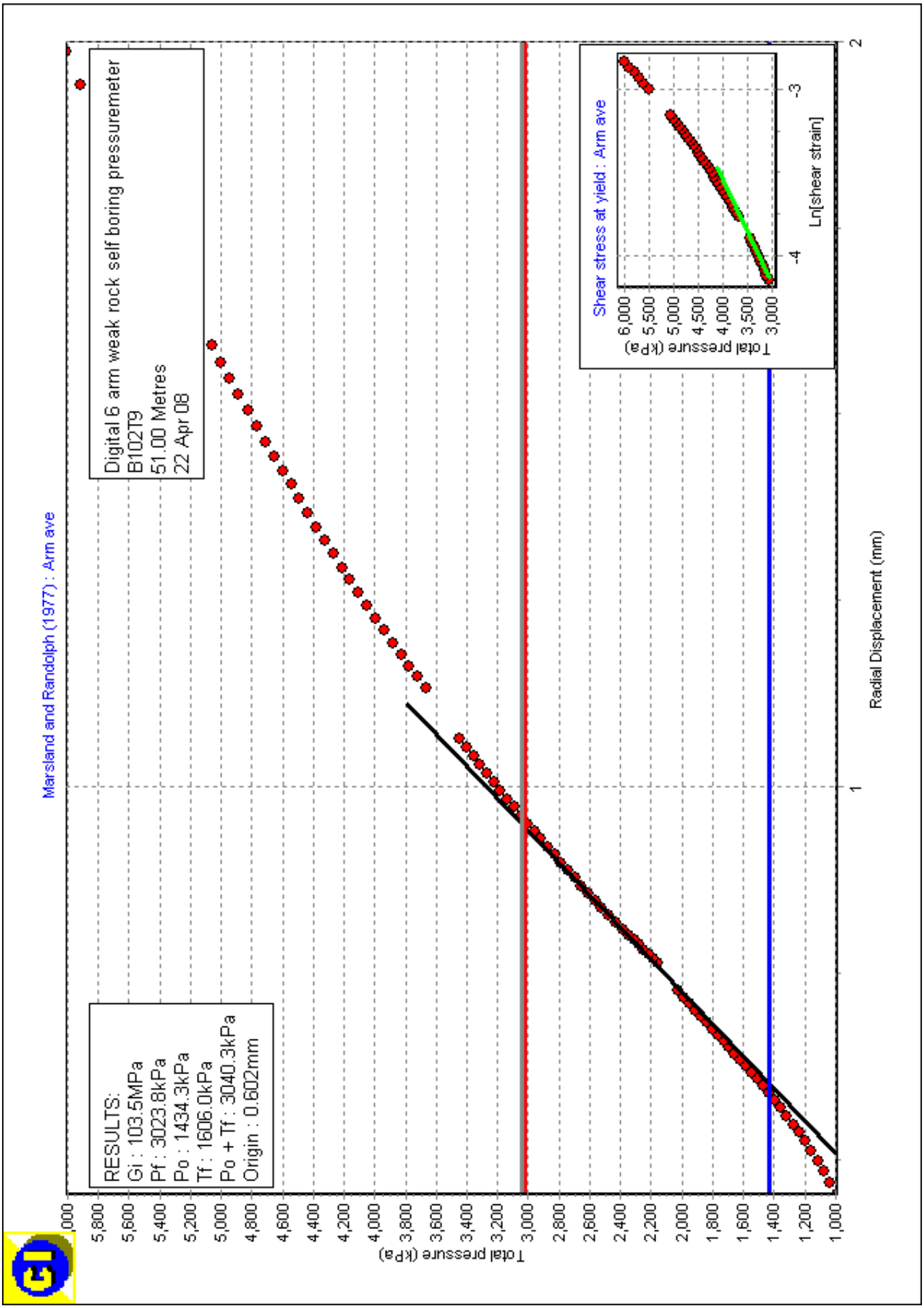
[LINEAR INTERPRETATION OF SHEAR MODULUS G]
Initial slope shear modulus (MPa) :"Arm ave=103.5"

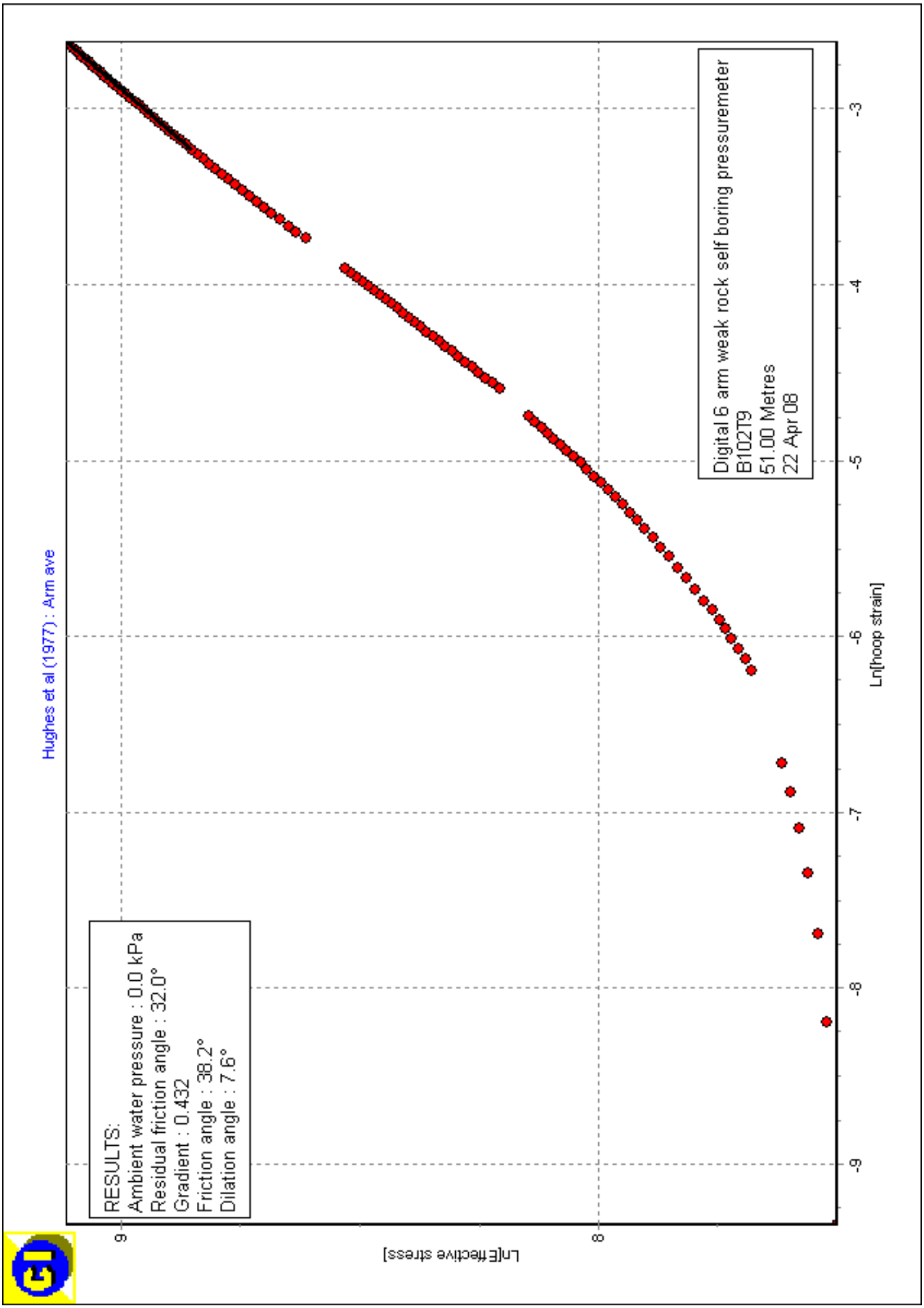
Axis	Loop No	Value (MPa)	Mean Strain (%)	Mean Pc (kPa)	dE (%)	dPc (kPa)
Arm ave	1	268.4	0.095	1679	0.225	604
Arm ave	2	286.8	0.846	2893	0.402	1156
Arm ave	3	285.8	2.029	4116	0.687	1971

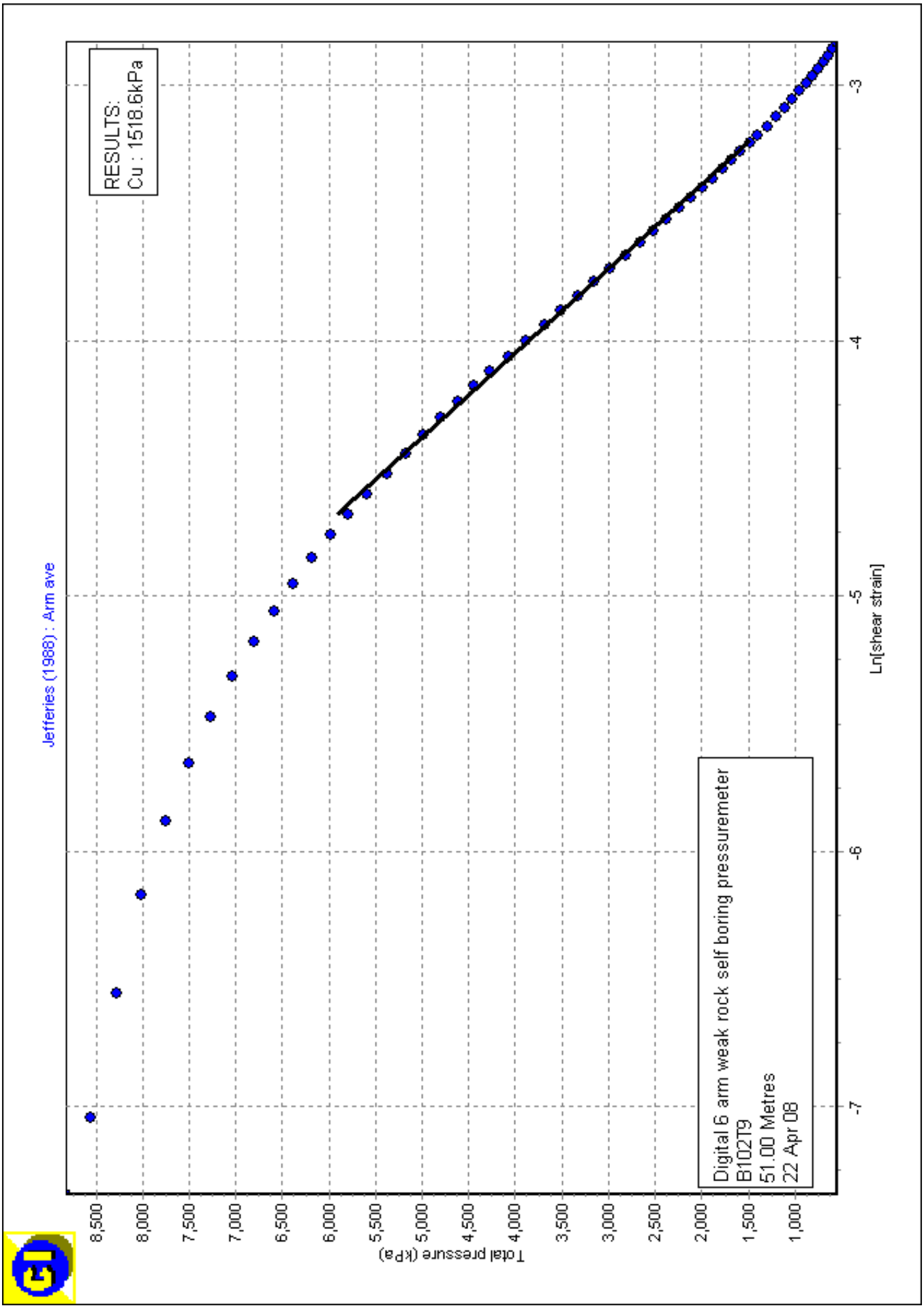
[NON LINEAR INTERPRETATION OF SECANT SHEAR MODULUS]

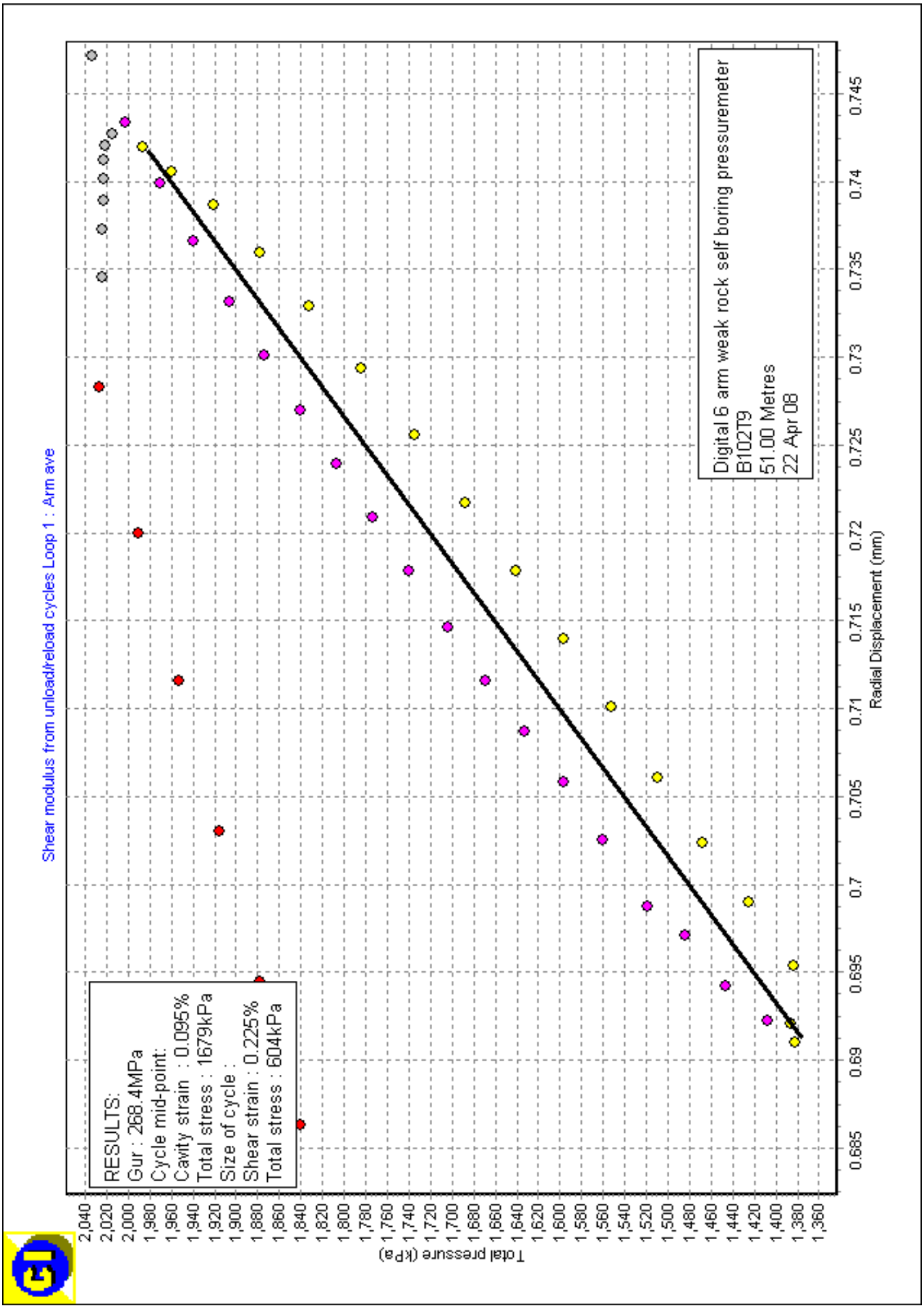
Axis	Loop No	Intercept (MPa)	Alpha (MPa)	Gradient
Arm ave	1	109.189	92.847	0.850
Arm ave	2	118.310	98.467	0.832
Arm ave	3	117.864	95.277	0.808

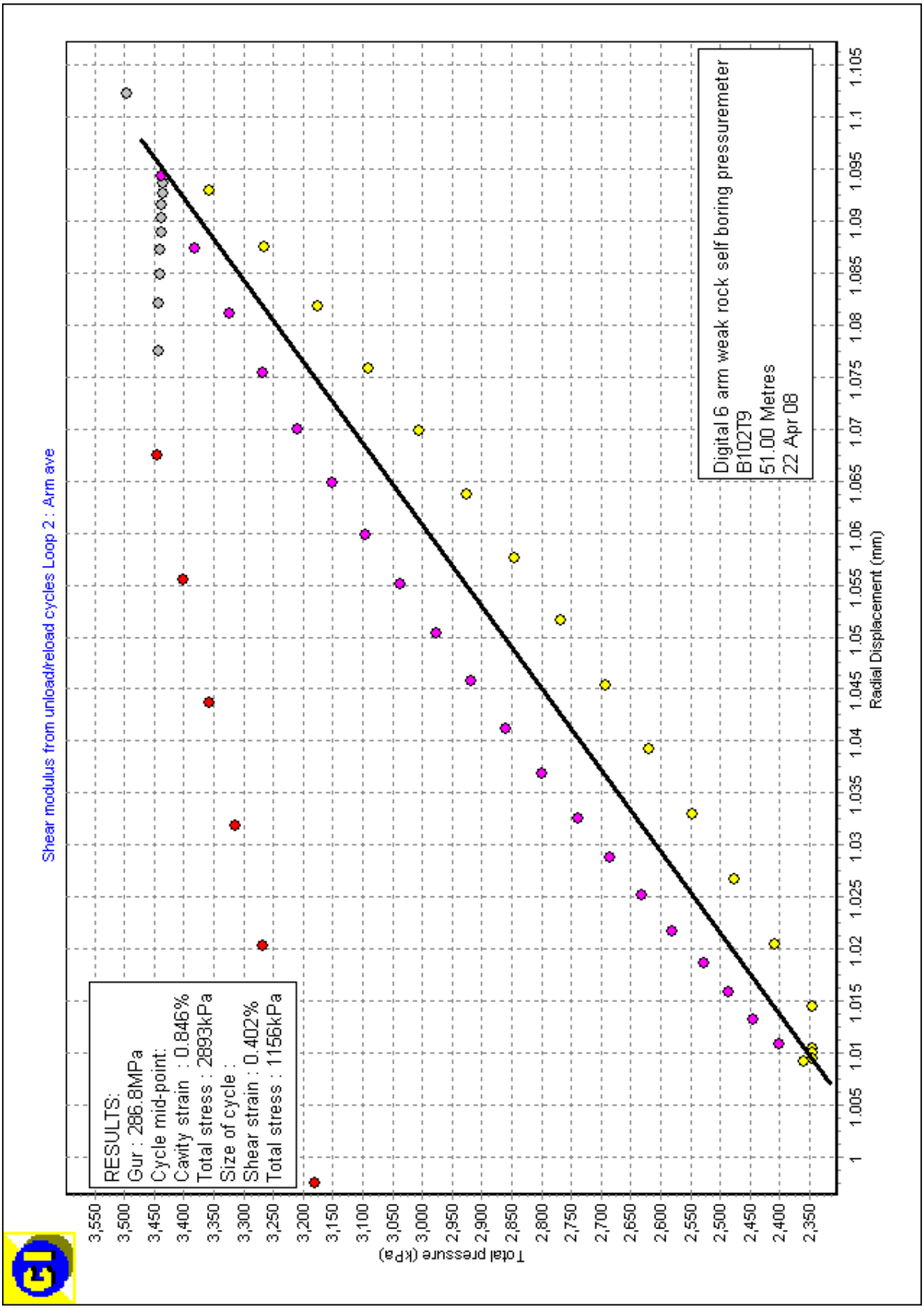

Cavity strain vs Total Pressure : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T9
51.00 Metres
22 Apr 08
Total pressure (kPa)
Cavity strain (%)

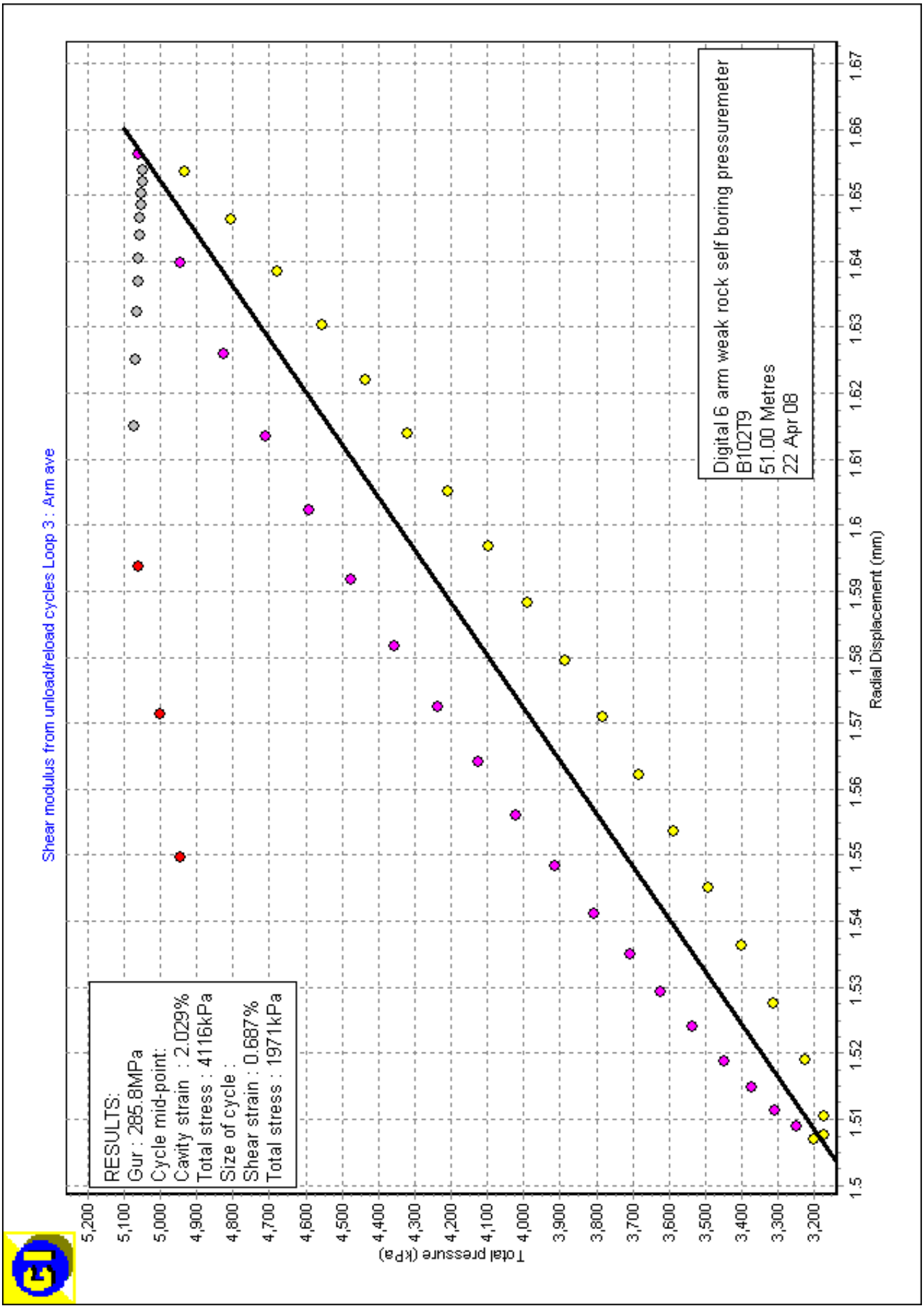

Digital 6 arm weak rock self boring pressuremeter
B102T9
51.00 Metres
22 Apr 08
RESULTS:
Gi : 103.5MPa
Pf : 3023.8kPa
Po : 1434.3kPa
Tf : 1606.0kPa
Po + Tf : 3040.3kPa
Origin : 0.602mm
Marsland and Randolph (1977) : Arm ave
Total pressure (kPa)
Radial Displacement (mm)
Shear stress at yield : Arm ave
Total pressure (kPa)
Ln[shear strain]

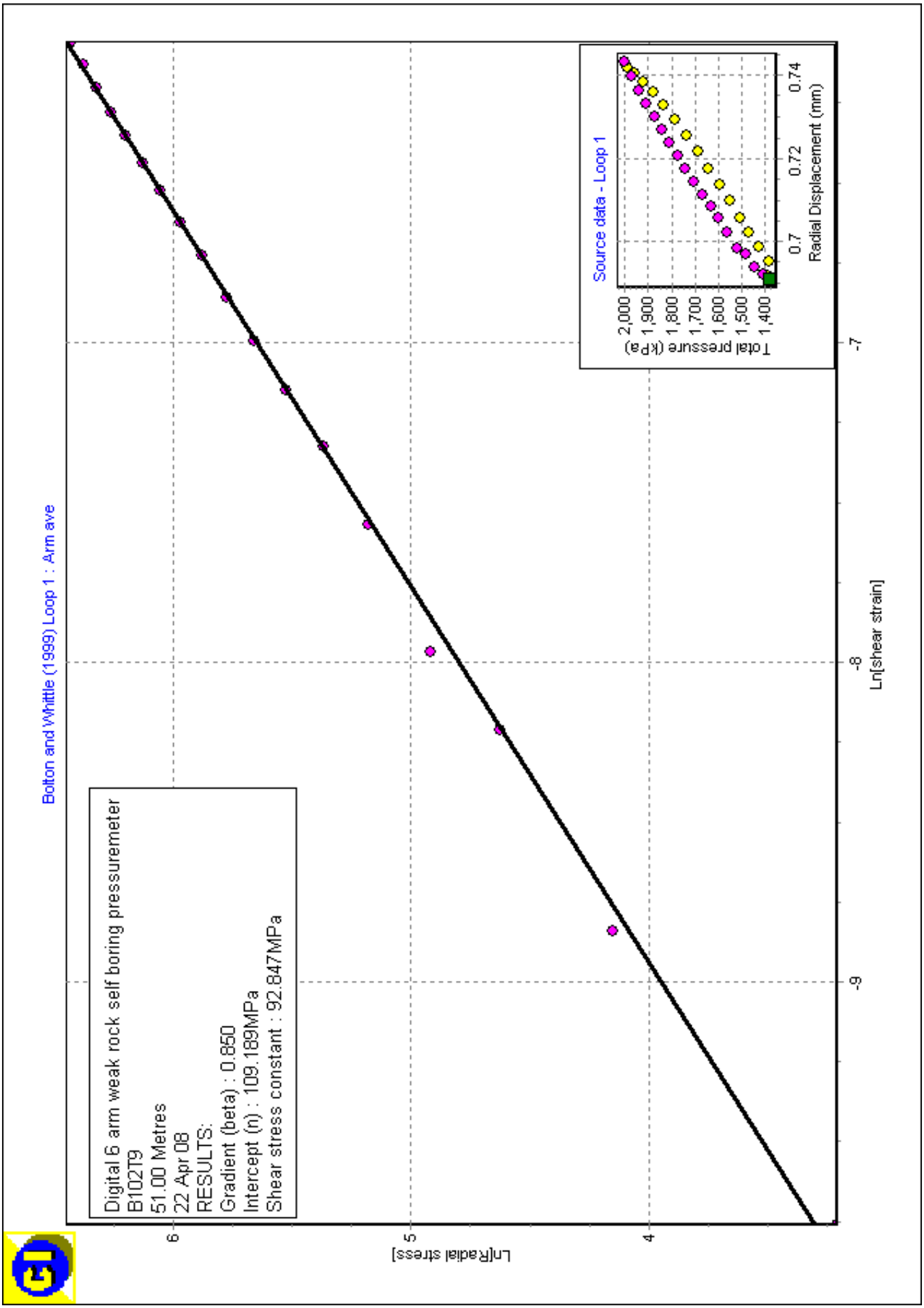

Hughes et al (1977) : Arm ave
RESULTS:
Ambient water pressure : 0.0 kPa
Residual friction angle : 32.0°
Gradient : 0.432
Friction angle : 38.2°
Dilation angle : 7.6°
Digital 6 arm weak rock self boring pressuremeter
B1027T9
51.00 Metres
22 Apr 08
Ln[Effective stress]
Ln[hoop strain]
9
8
6
-3
-4
-5
-6
-7
-8
-9

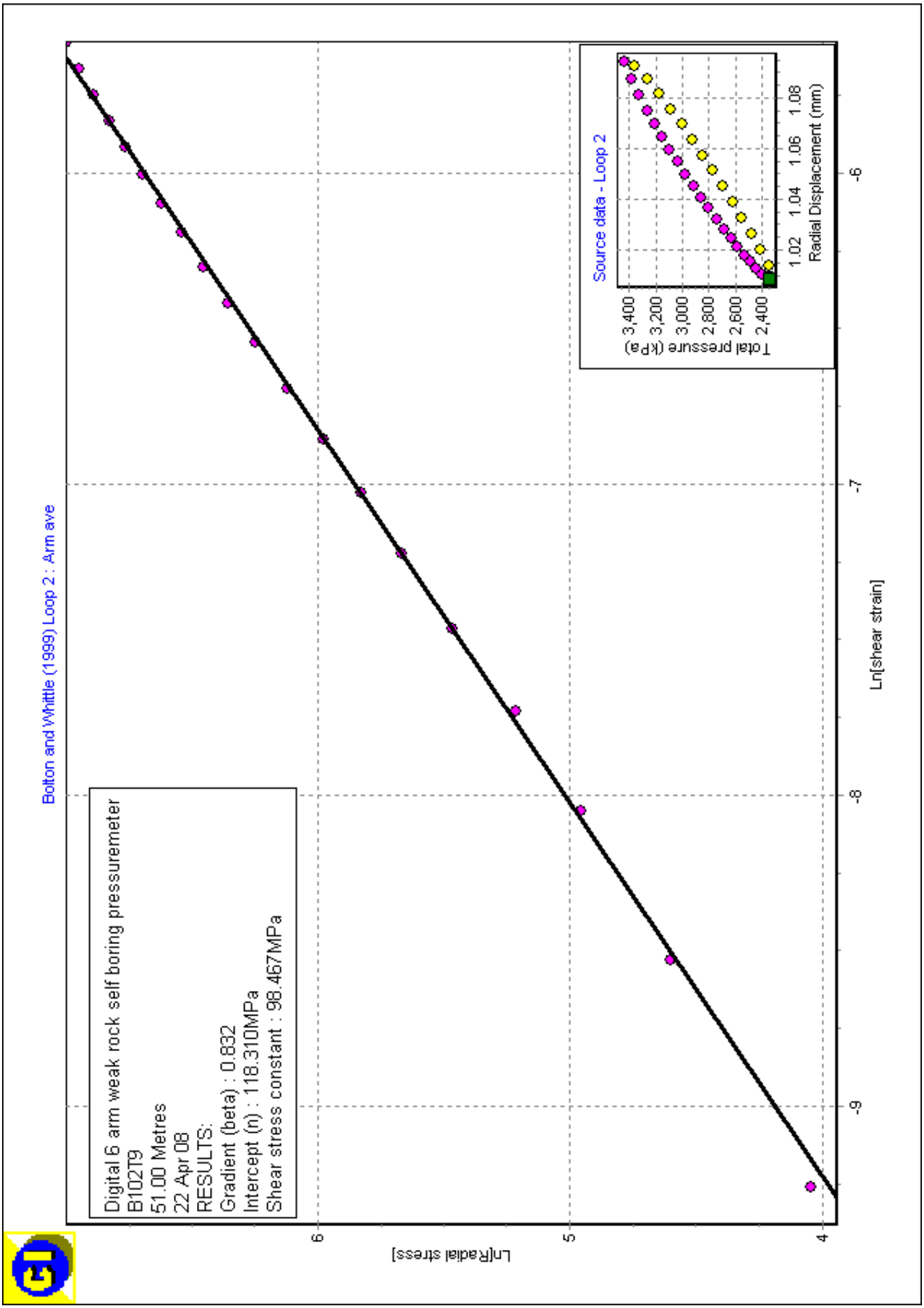

RESULTS:
Cu : 1518.6kPa
Jefferies (1988) : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T9
51.00 Metres
22 Apr 08
Total pressure (kPa)
Ln[shear strain]
8,500
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
-3
-4
-5
-6
-7

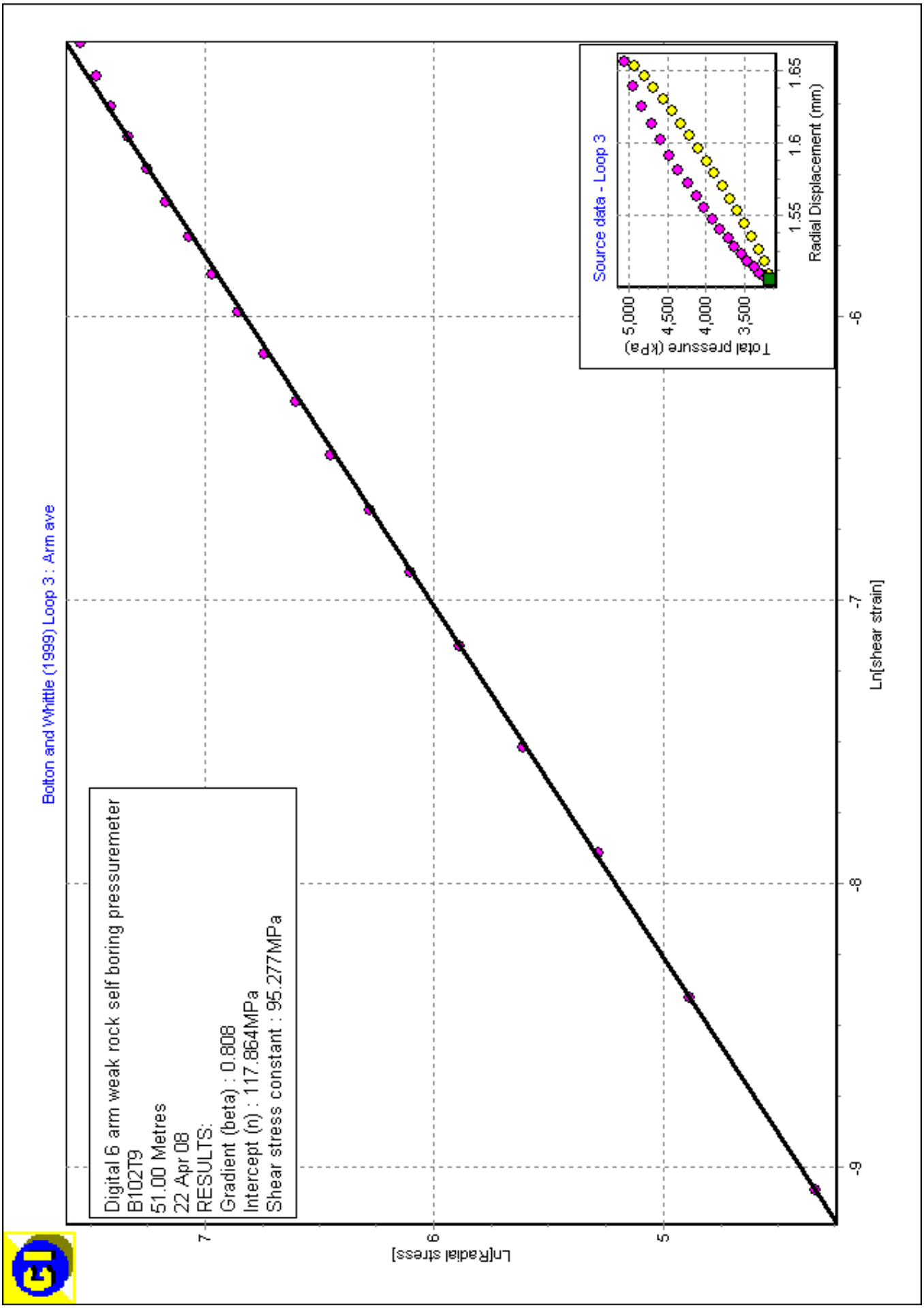

Shear modulus from unload/reload cycles Loop 1 : Arm ave
RESULTS:
Gur : 268.4MPa
Cycle mid-point:
Cavity strain : 0.095%
Total stress : 1679kPa
Size of cycle :
Shear strain : 0.225%
Total stress : 604kPa
Digital 6 arm weak rock self boring pressuremeter
B102T9
51.00 Metres
22 Apr 08
Total pressure (kPa)
Radial Displacement (mm)

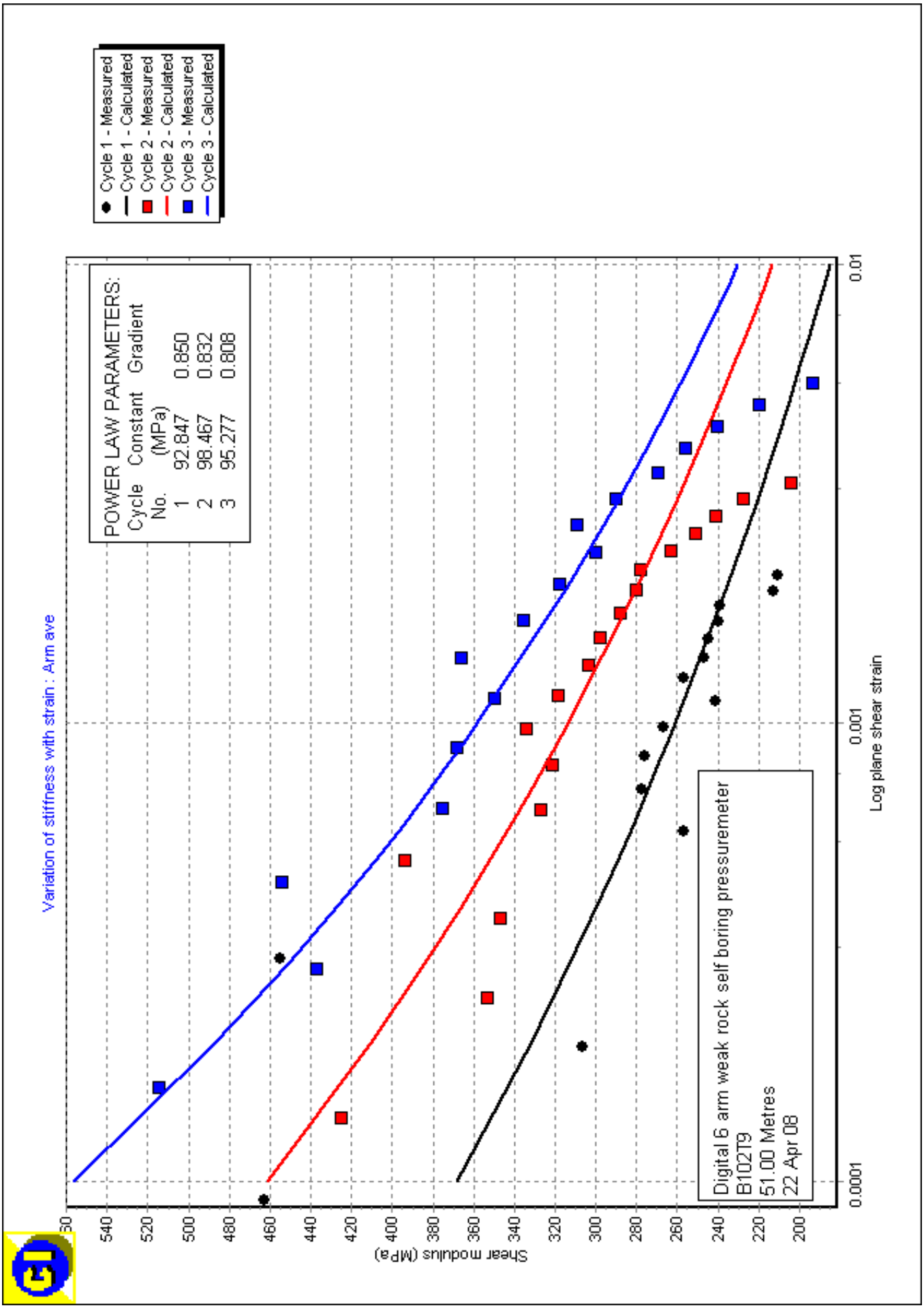

Shear modulus from unload/reload cycles Loop 2 : Arm ave
RESULTS:
Gur : 286.8MPa
Cycle mid-point:
Cavity strain : 0.846%
Total stress : 2893kPa
Size of cycle :
Shear strain : 0.402%
Total stress : 1156kPa
Digital 6 arm weak rock self boring pressuremeter
B102T9
51.00 Metres
22 Apr 08
Total pressure (kPa)
Radial Displacement (mm)


Shear modulus from unload/reload cycles Loop 3 : Arm ave
RESULTS:
Gur : 285.8MPa
Cycle mid-point:
Cavity strain : 2.029%
Total stress : 4116kPa
Size of cycle :
Shear strain : 0.687%
Total stress : 1971kPa
Digital 6 arm weak rock self boring pressuremeter
B102T9
51.00 Metres
22 Apr 08
Total pressure (kPa)
Radial Displacement (mm)

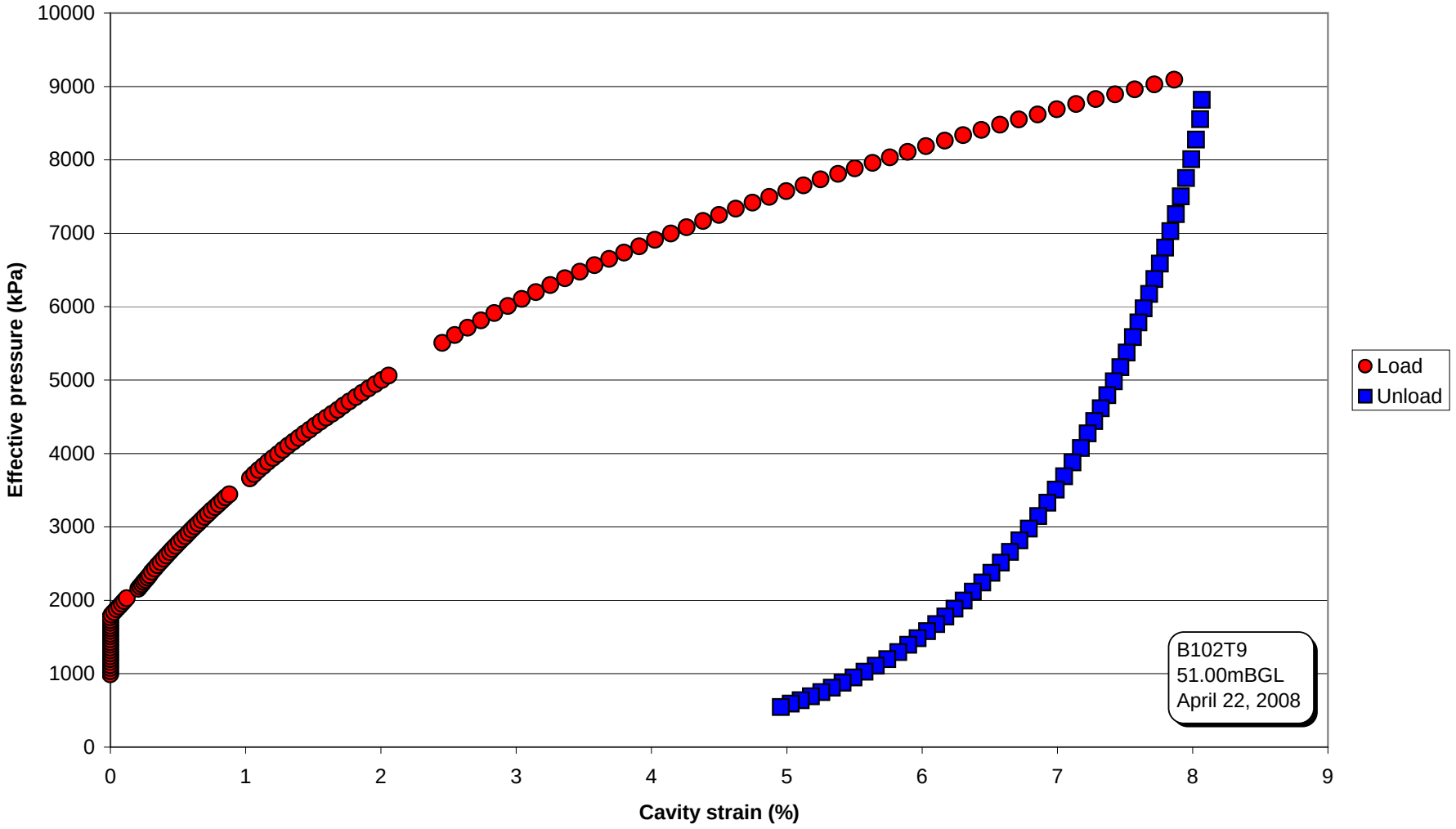

Bolton and Whittle (1999) Loop 1 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B1027I9
51.00 Metres
22 Apr 08
RESULTS:
Gradient (beta) : 0.850
Intercept (n) : 109.189MPa
Shear stress constant : 92.847MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 1
Total pressure (kPa)
Radial Displacement (mm)


Bolton and Whittle (1999) Loop 2 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B102T9
51.00 Metres
22 Apr 08
RESULTS:
Gradient (beta) : 0.832
Intercept (n) : 118.310MPa
Shear stress constant : 98.467MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 2
Total pressure (kPa)
Radial Displacement (mm)

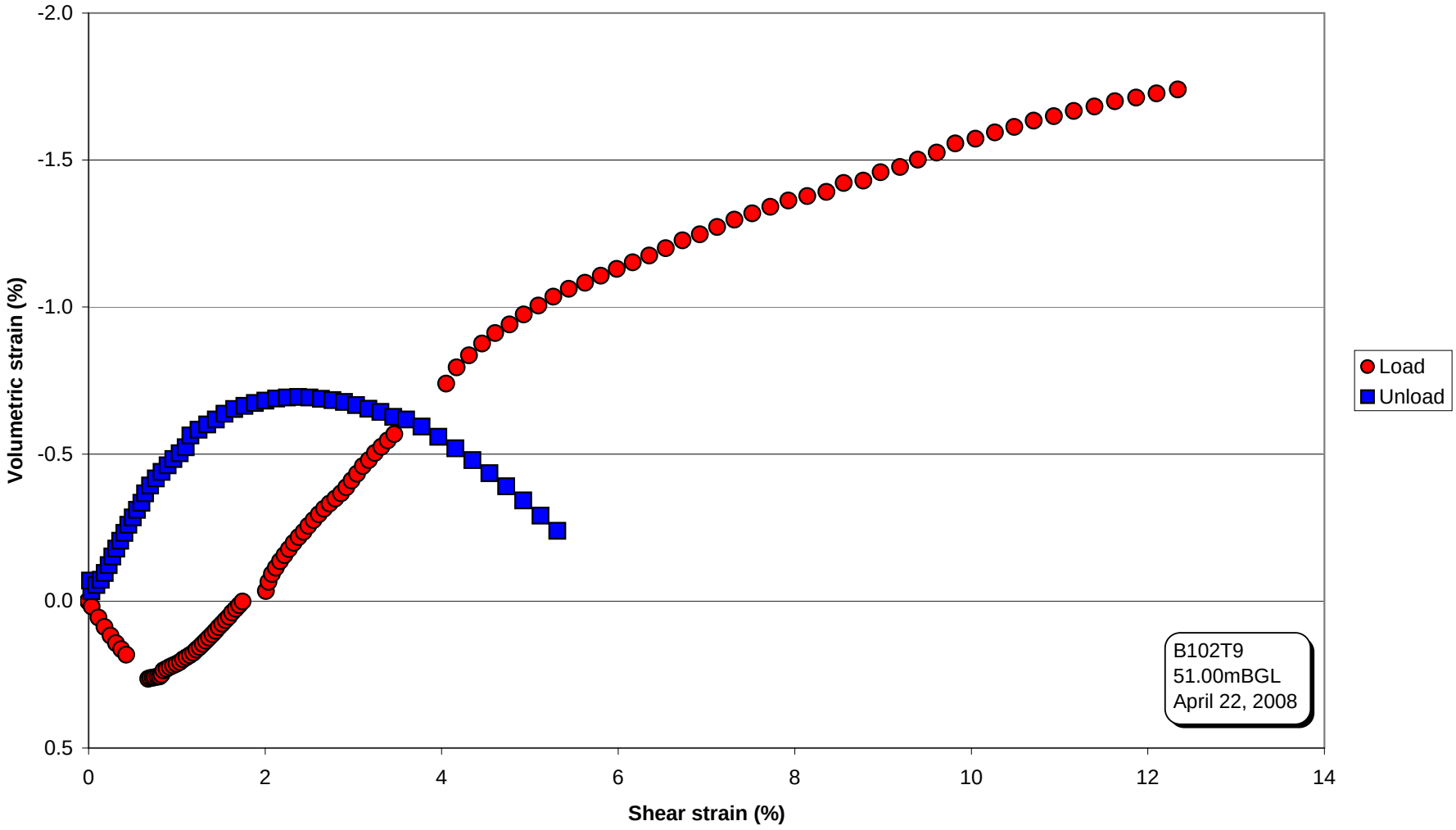

Bolton and Whittle (1999) Loop 3 : Arm ave
Digital 6 arm weak rock self boring pressuremeter
B1027T9
51.00 Metres
22 Apr 08
RESULTS:
Gradient (beta) : 0.808
Intercept (n) : 117.864MPa
Shear stress constant : 95.277MPa
Ln[Radial stress]
Ln[shear strain]
Source data - Loop 3
Total pressure (kPa)
Radial Displacement (mm)


Cycle 1 - Measured
Cycle 1 - Calculated
Cycle 2 - Measured
Cycle 2 - Calculated
Cycle 3 - Measured
Cycle 3 - Calculated
POWER LAW PARAMETERS:
Cycle No. Constant (MPa) Gradient
1 92.847 0.850
2 98.467 0.832
3 95.277 0.808
Variation of stiffness with strain : Arm ave
Shear modulus (MPa)
Log plane shear strain
0.0001
0.001
0.01
Digital 6 arm weak rock self boring pressuremeter
B10279
51.00 Metres
22 Apr 08

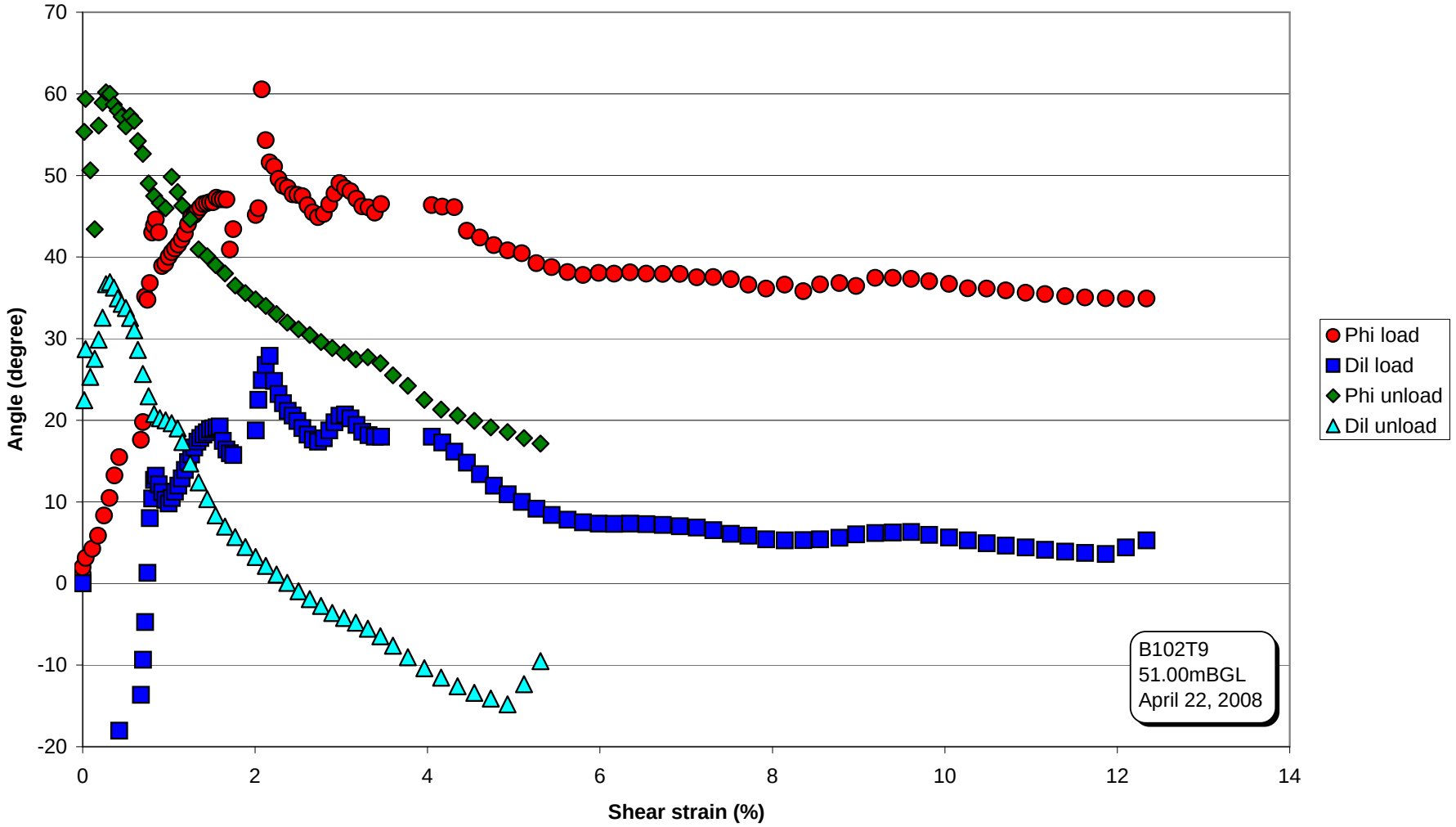
Effective pressure vs Cavity strain



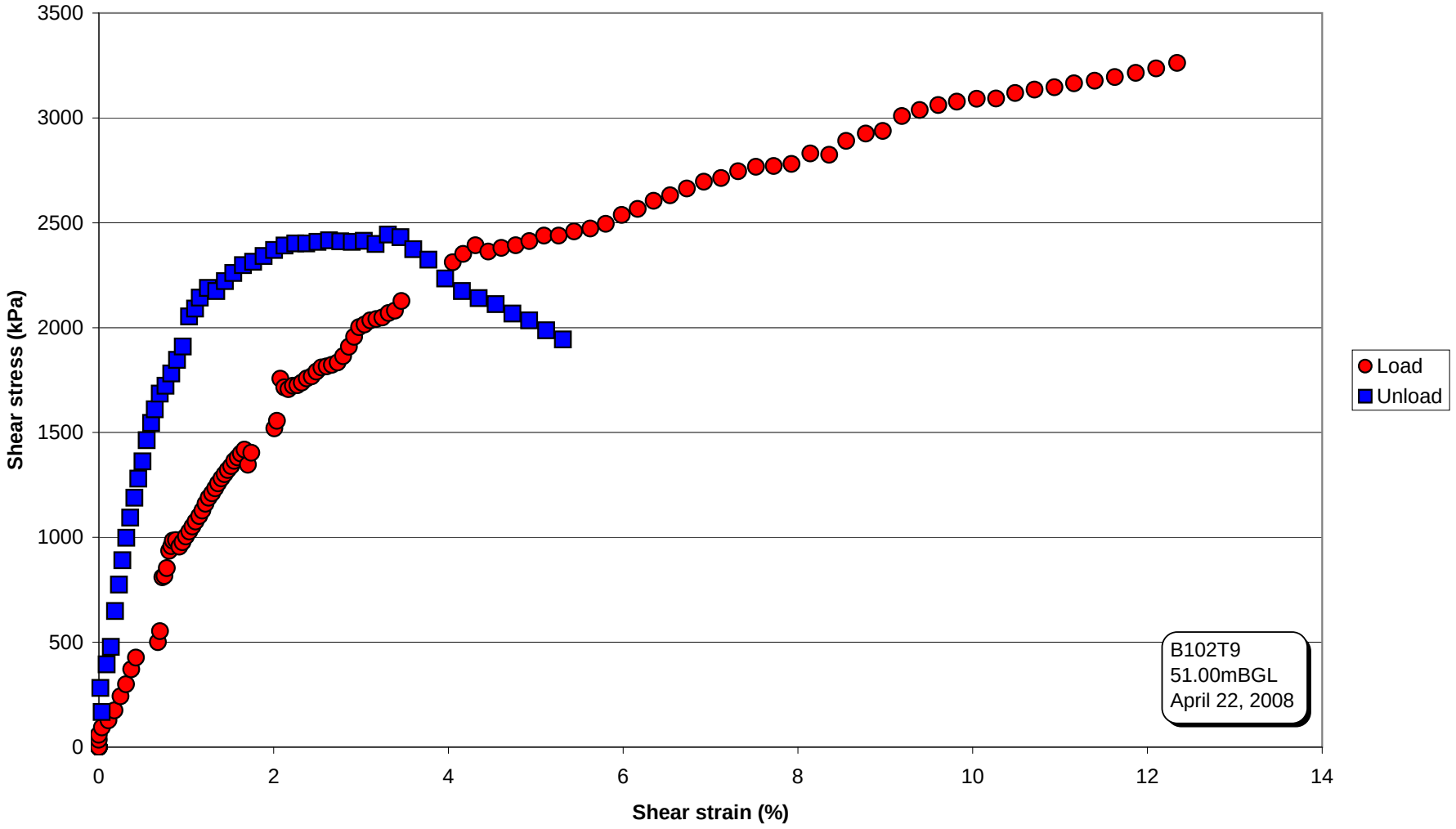
Volumetric strain vs Shear strain



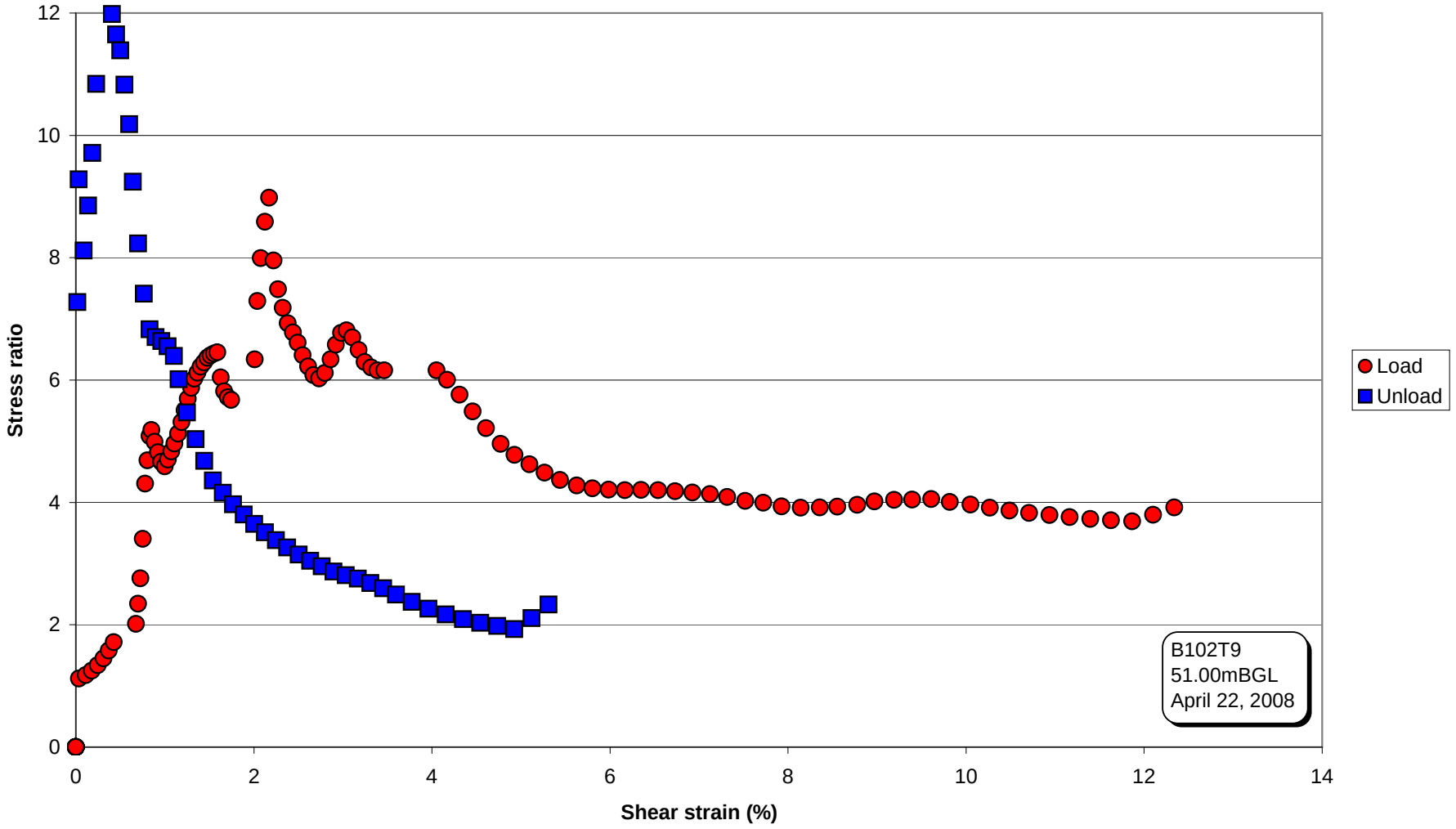
Angles of friction and dilation vs Shear strain

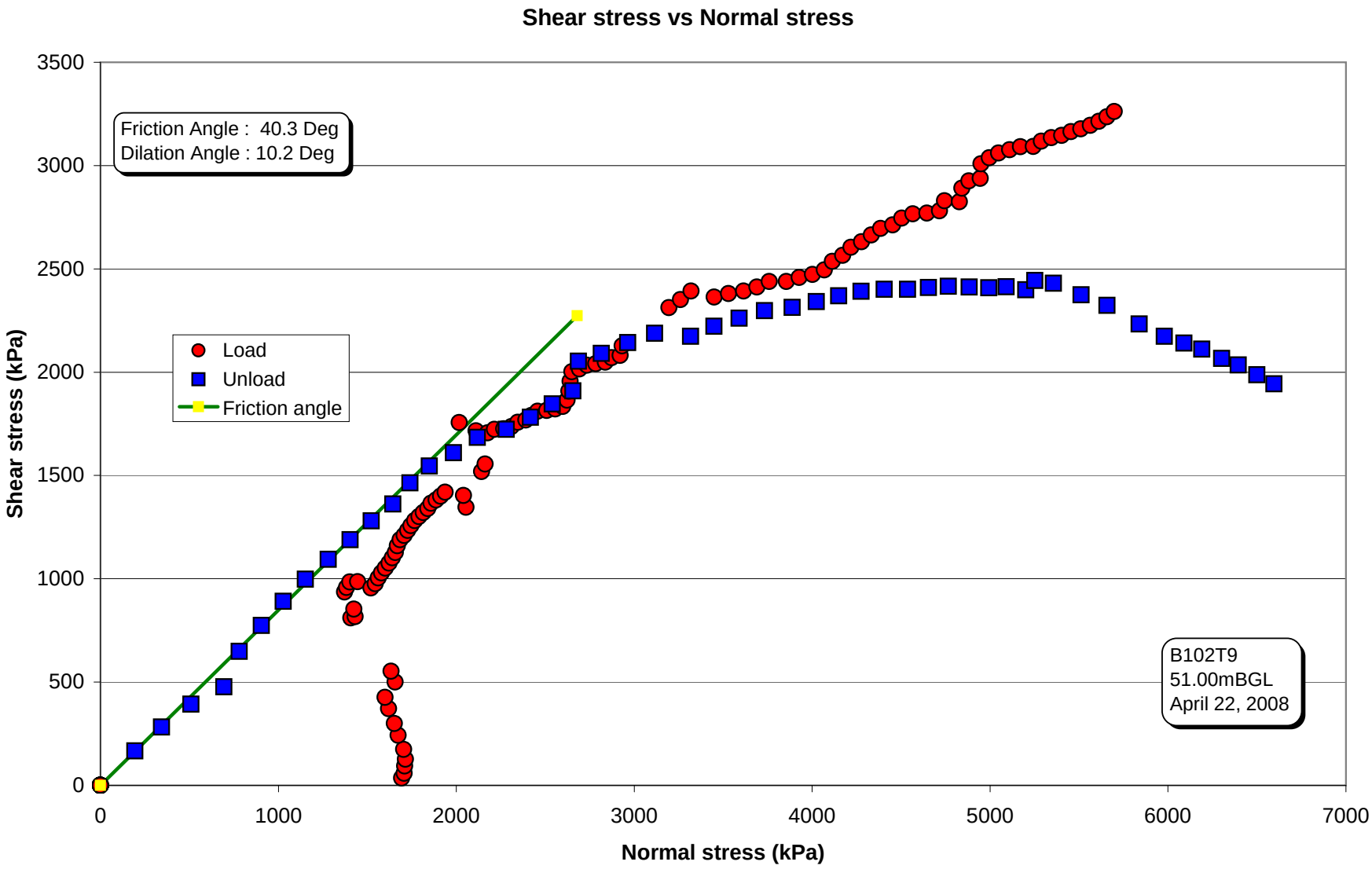


Shear stress vs Shear strain



Stress ratio vs Shear strain




Shear stress vs Normal stress
Friction Angle : 40.3 Deg
Dilation Angle : 10.2 Deg
Load
Unload
Friction angle
B102T9
51.00mBGL
April 22, 2008
Shear stress (kPa)
Normal stress (kPa)
0
500
1000
1500
2000
2500
3000
3500
0
1000
2000
3000
4000
5000
6000
7000

6 ARM SELF BORING PRESSUREMETER **TEST RECORD SHEET**

Site	Date	Day	Borehole	Test	Depth to Test Centre (below ground level)
Denmark Place	22/4/08	Tues	102	7	5m

Weather:-	Sunny !	Material:-	Thanet Sand

Water table	Drilling Start	Drilling End	Distance	Drill Rate	Ram Pressure
5.6	16:05	16:29	1m	1m/20min	160 Bars

Ground level :-	Orientation:- NR

Water Press.	Inst OD	Shoe OD	Cutter Type	Cutter position	Probe Reference
150kPa	88.1	89.1	73 RR	5mm Back	"Molly"

Drilling Remarks:- Steady – cut back up.

Strain Rate	Press. Rate	Cycle Time	Gas Bottle	Battery	PPC Type	Max Pressure Cap.
—	Manual	60sec.	—	—	True	10MPa

Arm 1	Arm 2	Arm 3	Arm 4	Arm 5	Arm 6	PPC A	PPC B	TPC	Date:-
-113	73	-78	41	-94	106	-915	-891	-2437	Ground Level Zeros
									Pre-drilling Zeros
									Post-drilling Zeros
-109	83	-71	46	-91	116	-918	-835	-2439	Pre-test Zeros
									Ground Level Zeros

Test starts:- 16:29.

Line	Notes
184	Horiz 2MPa
191	Loop 1 q = 2735kPa
262	Horiz 3.45MPa
272	Loop 2 q = 2925kPa
338	Horiz 5.1MPa.
349	Loop 3 q = 2655kPa.
437	unload.

Test ends:- 17:09 Max Press:- 9098kPa.

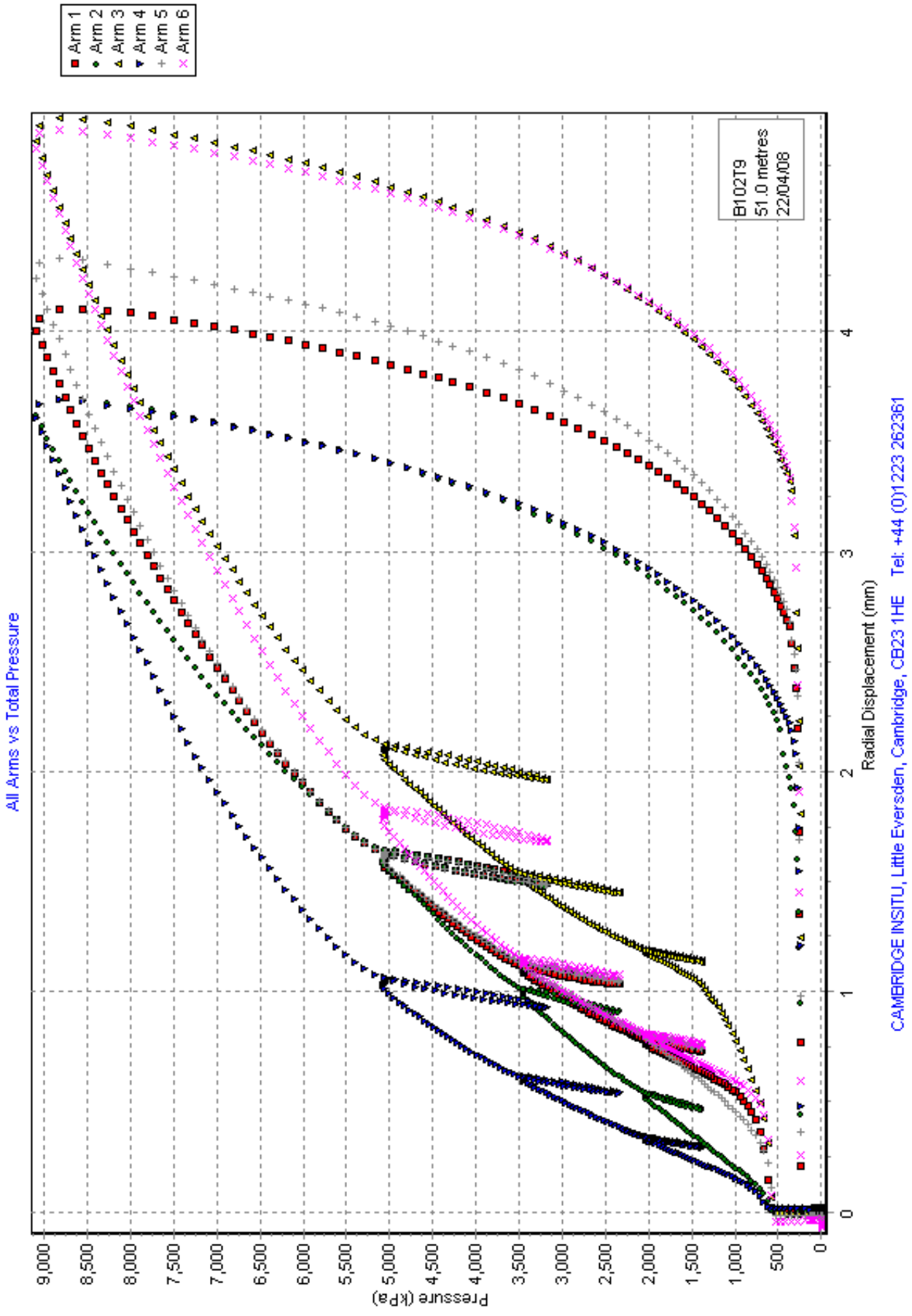
Calibrated Data details:

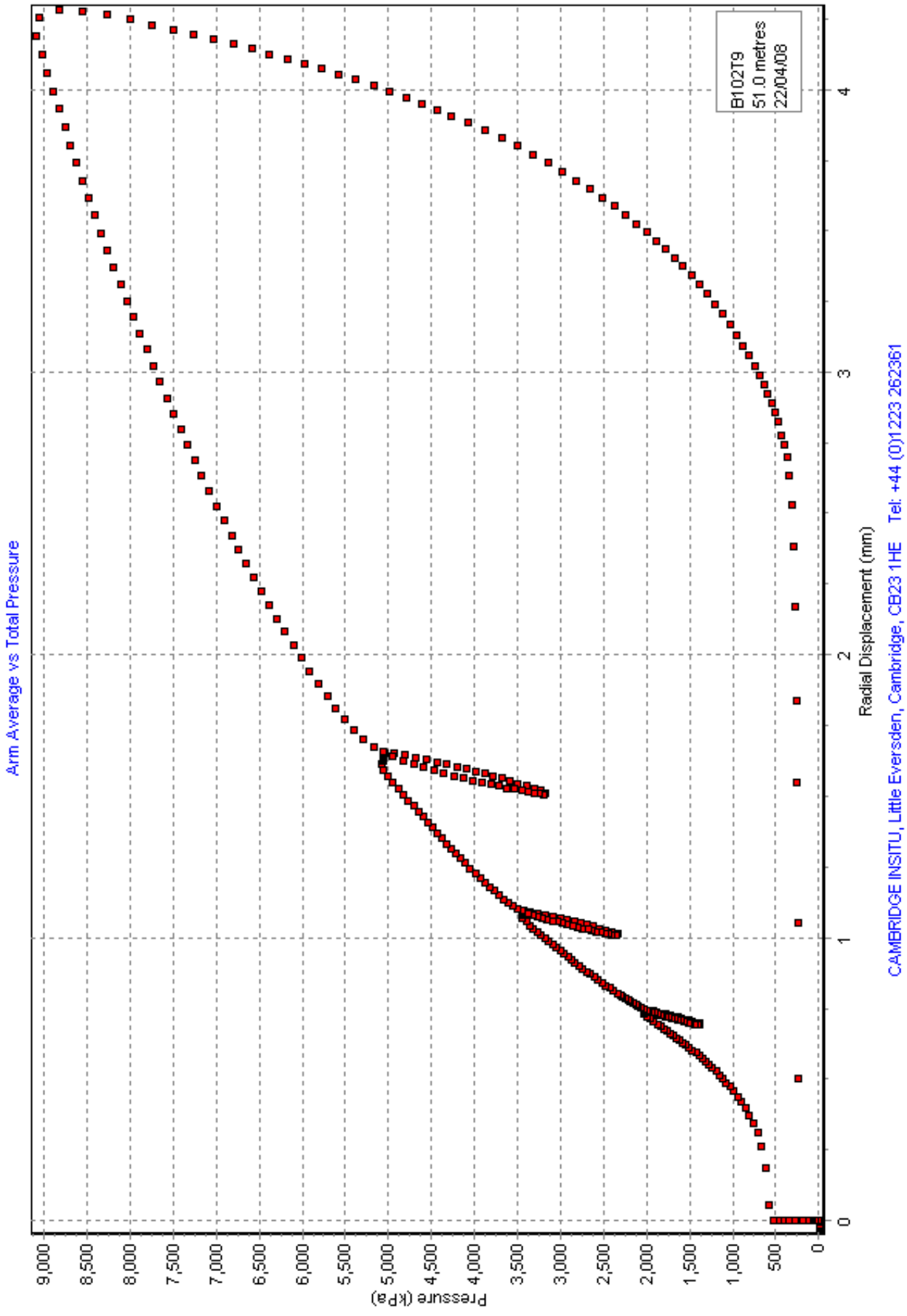
Mem. Correction.	Mem. Compression.	Strain Cals.	Pressure Cals.
W013077	W013072	10/4/08	11/4/08

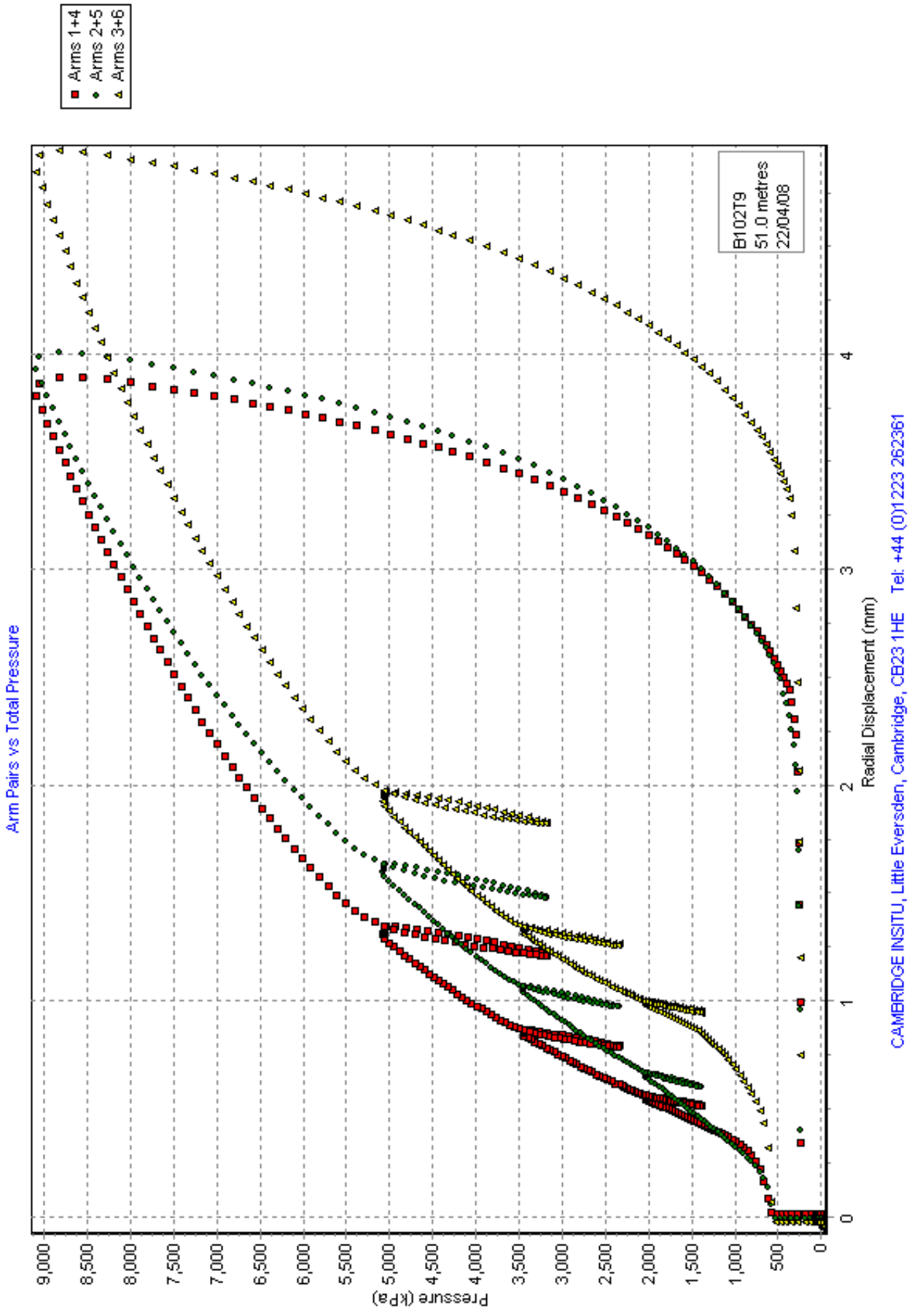
TEST REMARKS: Really nice Thanet Sand test. Slight PWP generated during plastic phase. Comfortable, steady drill – cut back an up.

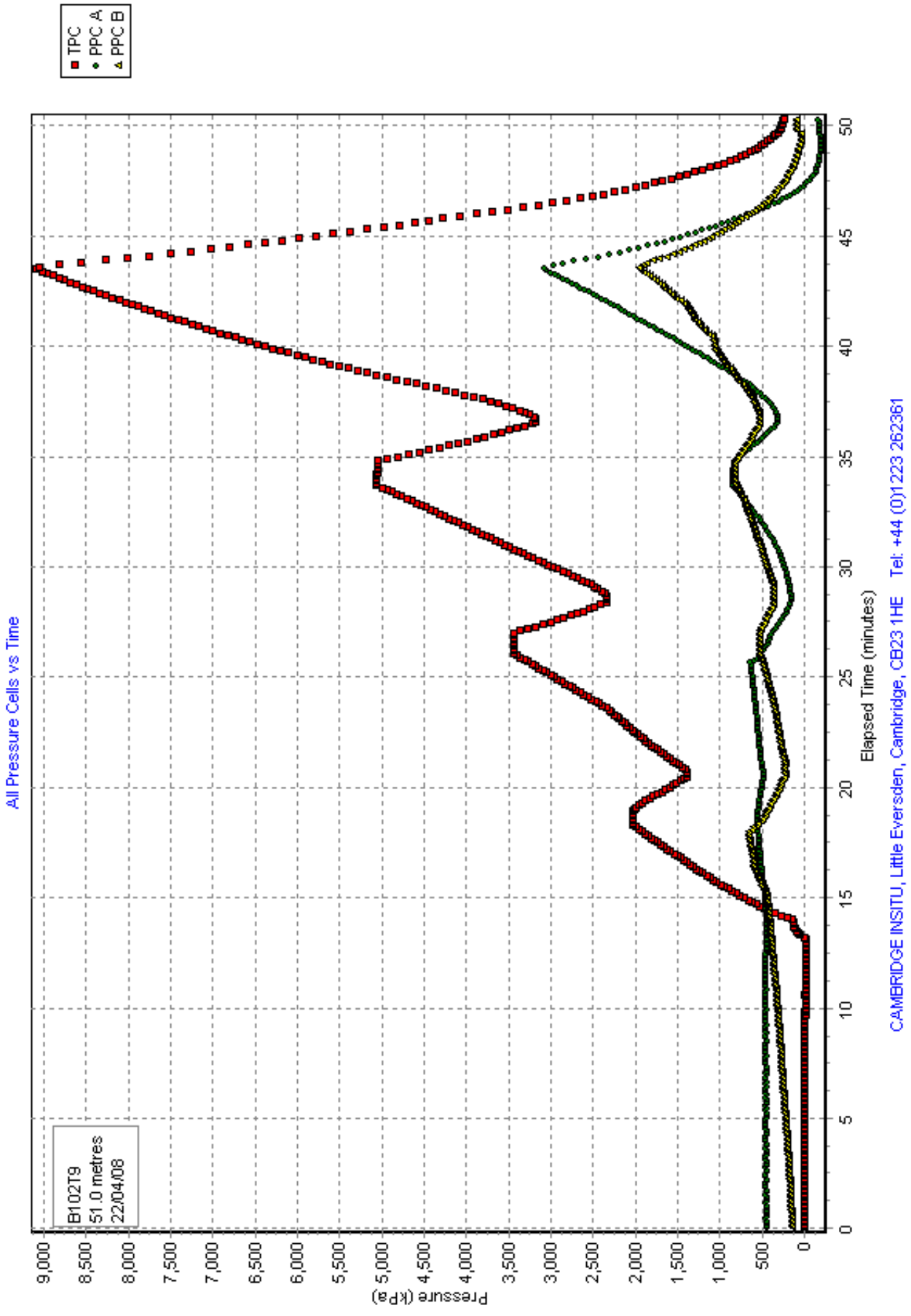
Driller: Dan

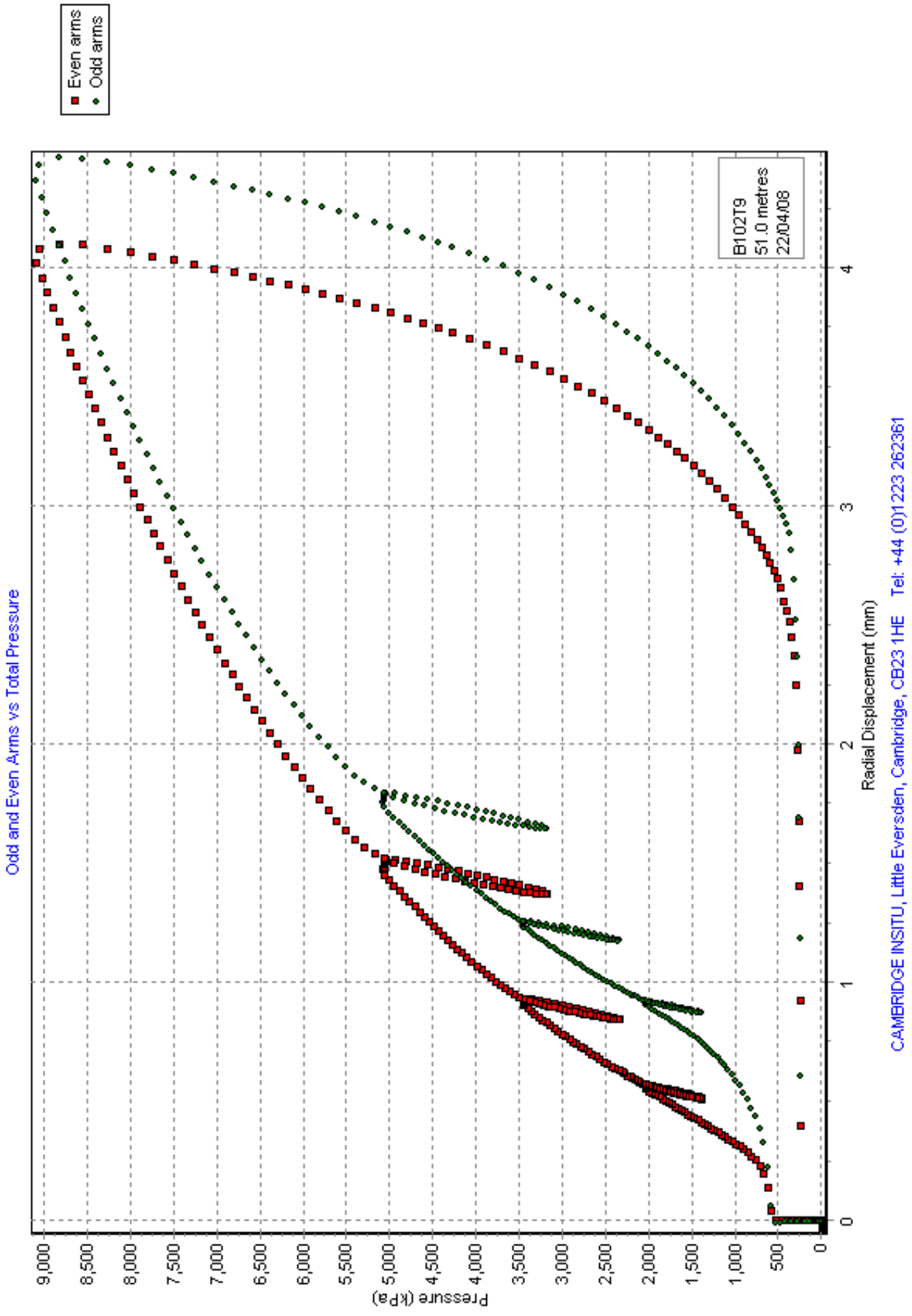
Tester: RW.


Arm 1
Arm 2
Arm 3
Arm 4
Arm 5
Arm 6
All Arms vs Total Pressure
B102T9
51.0 metres
22/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arm Average vs Total Pressure
B102T9
51.0 metres
22/04/08
Pressure (kPa)
9,000
8,500
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
1
2
3
4
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Arms 1+4
Arms 2+5
Arms 3+6
Arm Pairs vs Total Pressure
B102T9
51.0 metres
22/04/08
Pressure (kPa)
Radial Displacement (mm)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


TPC
PPC A
PPC B
All Pressure Cells vs Time
B102T9
51.0 metres
22/04/08
Pressure (kPa)
Elapsed Time (minutes)
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361


Even arms
Odd arms
Odd and Even Arms vs Total Pressure
B102T9
51.0 metres
22/04/08
Pressure (kPa)
9,000
8,500
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Radial Displacement (mm)
0
1
2
3
4
CAMBRIDGE INSITU, Little Eversden, Cambridge, CB23 1HE Tel: +44 (0)1223 262361